

NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA) Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

#### **BE CIVIL ENGINEERING**

1902CE401	BUILDING MATERIALS AND MANAGEMENT	L	Т	Р	С
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	BUILDING MATERIALS			9 Ho	
	imber and its Products, Floor and Wall Tiles, Pozzolanas, Ferrous meta				
	ing Materials: Glass, Timber, Aluminum, Plastics, Paints, Varnishes, Dis				
	fing Materials, Ferrocement and its application, Fabre textiles – Geo mem	oranes a	nd Ge	otext	iles
for earth reinfor	BUILDING COMPONENTS			9 Ho	
	nd Cavity wall, Composite Masonry, Doors, Windows, Ventilators, Stairs,			9 ПО	urs
	Termite Treatment, Brick masonry- Bond- Jointing-Stone masonry	LIII, Ka	mps,		
	ding structures - Site Clearance - Marking –Earthwork, Slip and moving for	rms see	affold	ino	
	anitation, Fire Protection, Introduction to Building Maintenance, Acoustic			<u>5</u> ,	
Insulation.					
	SUB STRUCTURE AND SUPERSTRUCTURE TECHNIQUES			9 Ho	urs
	ox jacking- pipe jacking- under water construction of diaphragm walls and				
	niques, caisson -sinking cofferdam, Dewatering and stand by plant equipme			round	1
	h, Launching girders, bridge decks, off shore platforms, braced domes and	space de			
	CONSTRUCTION EQUIPMENTS			9 Ho	urs
	ipment for earth work - types of earthwork equipment, Equipment for mat				1
	stures, Equipment for dredging, trenching, tunneling, Equipment for comparent for comparent for foundation and pile driving.	iction, b	atchir	ig and	1
	MANAGEMENT			9 Ho	ure
	gement - Material Procurement and Delivery - Inventory Control - Tradeo	fs of C			uis
Materials Mana		15 01 00	/5t5 III		
	Tot	al:	4	5 Ho	urs
COURSE OUTCO	MES:				
1. Summari	ze the most common and advanced materials used for construction.				
2. Illustrate	the construction process of various building components.				
	he various construction methods and techniques involved in sub structure	and supe	er stru	cture.	
4. Choose t	he appropriate modern construction tools and equipment in various constru	ction ac	tivitie	es.	
5. Choose t	he appropriate method of management for materials.				
REFERENCE	S:				
	, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.				
2. Rajput. R.K.,	"Engineering Materials", S. Chand and Company Ltd., 2008.				
3.Gambhir.M.L.,	"Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 20	04			
4. Duggal.S.K.,	"Building Materials", 4th Edition, New Age International, 2008.				
	Alternative Building Materials Technology", New Age International, 2	007.			
	, &NehaJamwal., "Building Materials, products, properties and system	s",			
Tata McGraw Hi	ll Educations Pvt. Ltd, New Delhi, 2012.				



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	3.			udents to								laings	5.	
	4.			the imp							ystem.			
	5.			bility to					ient sys	lem.				
11	6. WATEI			significa		-							0.11	[
Unit I Objectives – P											NITCE S	electic		lour: Vate
quality parame														
and testing of p						te struct	ures –	COnve	yanee -	Tryutau	ines –	Layin	g, joi	mm
Unit II						TREA	TMEN	IT					9 H	lours
Objectives – S									floccul	ation. se	diment	ation.		
disinfection –														
Demineralizati														
management.		411011	non n	une vui	Dena	orrautio	n op	orano	ii uiiu i	laintona	nee us		100	braa
Unit III	<b>DISTRI</b>	BUTI	<b>ION</b>										9 H	lours
Requirements				omponer	nts -Ser	vice res	ervoirs	-Func	tions ar	d drawi	ngs -N	etwor		
Analysis of dis														
and maintenan	ce -Leak d				s memor	d – Equi	valent	pipe m	iethod -	Pipe Ap	purten	ances		
	ce Leun u	letectic	on, Meth									ances	-1	
Unit IV	SEWER			ods. Hou	ise servi	ice conn	ection -	- Syste	ms of p	umbing				lours
Unit IV	SEWER	RAGE	SYSTE	ods. Hou <mark>M, COL</mark>	use servi	ice conn ION AN	ection -	- Syste ANSM	ms of p IISSIO	lumbing. <mark>N</mark>			я 9 Н	
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE552		ENVIRONMENTAL ENGINEERING LAB	L	Т	P	C
			0	0	2	1
<b>Course Objec</b>	tives:					
· · · · ·	1. To know th	he basics, importance of water and wastewater treatment and meth	ods m	leasu	remen	ıt.
		e various effects of water and waste water pollution.				
	3.Effect of	BOD and COD				
	4.To find C	alcium, Potassium and Sodium				
	5.Heavy me	etal effects and finding methods				
List of experim						
1. Measu	rement of pH	I, Electrical conductivity and turbidity				
2. Deterr	nination of C	alcium, Potassium and Sodium				
3. Deterr	nination of Pl	hosphate and Sulphate				
4. Deterr	nination of O	ptimum Coagulant Dosage by Jar test apparatus				
5. Deterr	nination of av	vailable Chlorine in Bleaching powder and residual chlorine in wat	er			
6. Deterr	nination of A	mmonia Nitrogen				
7. Estima	tion of suspe	nded, volatile and fixed solids				
8. Deterr	nination of D	vissolved Oxygen				
<mark>9. Estima</mark>	<mark>tion of B.O.I</mark>	D				
10. Estima	tion of C.O.	D				
			Tota	ıl:	45 H	ours
<b>Course Outco</b>	mes:					
		letion of the course, Student will be able to				
	1.characteri	ze given water and waste water sample				
References:						
1.Standard met	hods for the	examination of water and wastewater, APHA, 20th Edition, Wash	ingtor	n, 199	98	
		tal Engineering Vol. I & II", Khanna Publishers, New Delhi	-			
		ntal Engineering Vol. I & II", Standard Book House, Delhi-6				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE603		HYDROLOGY AND WATER RESOURCES ENGINEERING	L	Т	Р	С
			3	0	0	3
<b>Course Objec</b>	ctives:					
		ce the student to the concept of hydrological aspects of mentsand should be able to quantify, control and regulate the				
Unit I	<b>PRECIPI</b>	CATION AND ABSTRACTIONS			9 Ho	ours
Hydrological	l cycle-]	Meteorological measurements-Requirements, types	ar	ıd	for	ms
ofprecipitatio	on-Rain Gau	ges-Spatial analysis of rainfall data using Thiessen and Is	sohy	etaln	netho	ds-
Interception-						nd
evaporations	uppression-I	nfiltration-Horton's equation-double ring infiltrometer, infiltr	ratio	n ind	ices	
Unit II	RUNOFF	1 8 9			9 Ho	ours
		d basin-Catchment characteristics-factors affecting runoff-R	Run	offes		
		s table and SCS methods-Stage discharge relationshipsflow				
Hydrograph-				easai	ennen	
Unit III		ND DROUGHT			9 Ho	nirs
•		podEstimation-Frequency Analysis-Flood Control-D	)efin	ition		of
		hydrological and agricultural droughts-IMD method-NDVI				
Prone Area P	0,		anai	y 515-	Diou	Sint
Unit IV					9 Ho	11100
( least set of		ing Consul uningial of degion site selection smill-		arrati.		~ ~
		ors, General principles of design, site selection, spillways,	, ele	evatio	on–ar	ea-
capacity-stor	age estimation	on, sedimentation-life of reservoirs-rule curve	, ele	evatio		
capacity-stor Unit V	age estimation	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT			9Ho	ours
capacity-stor Unit V Origin-Class	age estimation GROUND ification and	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations-steady and			9Ho	ours
capacity-stor Unit V Origin-Class	age estimation GROUND ification and	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations-steady and in rural and urbanareas	ndun	istead	9Ho <mark>ly flo</mark>	ours <mark>w-</mark>
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capacity-stor Unit V Origin-Class	age estimation GROUND ification and harge-RWH i	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations-steady and in rural and urbanareas Total	ndun	istead	9Ho <mark>ly flo</mark>	ours <mark>w-</mark>
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capacity-stor Unit V Origin-Class artificial rech Further Read	age estimation GROUND ification and harge-RWH inage	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations-steady and in rural and urbanareas Total oprepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to nthe key drivers on water resources, hydrological processe ted behavior in catchments use ofhydrological models to surface water problemsincluding eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood and ement strategies be theimportance of spatial analysis ofrainfall and design w irs	ndur I:   g bas I Dr wate	ndthee iin	9Ho ly flo 45 Ho ir	ours <mark>w-</mark>
capacity-stor Unit V Origin-Class artificial rech Further Read Course Outco	age estimation GROUND ification and harge-RWH ing: 1. How to 2. Civil e omes: After comp 1. Explain integrat 2. Make u charact 3. Outline manage 4. Describ reservo 5. Illustra	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations-steady and in rural and urbanareas Total oprepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to nthe key drivers on water resources, hydrological processe ted behavior in catchments use ofhydrological models to surface water problemsincluding eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood and ement strategies be theimportance of spatial analysis ofrainfall and design w irs	ndur I:   g bas I Dr wate	ndthee iin	9Ho ly flo 45 Ho ir	ours <mark>w-</mark>



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1901MGX01		TOTAL QUALITY MANAGEMENT	L	Т	P	С
			3	0	0	3
<b>Course Objectiv</b>	ves:	To facilitate the understanding of Quality Managen	nent p	orinc	ples	and
		process.				
Unit I I	NTROD	UCTION			9 Ho	urs
Introduction – N	eed for o	quality – Evolution of quality – Definitions of qualit	y – D			
		ity - Basic concepts of TQM - TQM Framework				
Deming, Juran	and Cro	sby – Barriers to TQM – Quality statements – (	Custo	mer	focu	<mark>.s —</mark>
Customer orienta	ation, Cu	stomer satisfaction, Customer complaints, Customer	r rete	ntion	– C	<mark>osts</mark>
of quality.						
		NCIPLES			9 Ho	
		e quality planning, Quality Councils – Employed				
	<b>.</b>	ent, Team and Teamwork, Quality circles Recogni				
		– Continuous process improvement – PDCA cyc	le, 58	5, K	aizen	_
		Partnering, Supplier selection, Supplier Rating			0.11	
		OLS AND TECHNIQUES I	•		<u>9 Ho</u>	
		ools of quality – New management tools – Six				
		ns to manufacturing, service sector including IT – ench marking process – FMEA – Stages, Types.	Bend	en m	arkin	<u>g</u> –
		OLS AND TECHNIQUES II			9 Ha	
		Capability – Concepts of Six Sigma – Quality Fund	otion			
		v loss function – TPM – Concepts, improvement new				
measures.	ii quunty		Cub	1 011	omi	
	UALIT	Y SYSTEMS			9Ho	urs
		SO 9001-2008 Quality System – Elements, Docur	nenta	tion.		
Auditing – QS	9000	- ISO 14000 - Concepts, Requirements and	Bene	fits	- `T	QM
		acturing and service sectors.				`
		Tot	al:	4	5 Ho	urs
Further Reading	g:					
1.	. Engine	eering economics and cost analysis				
2.	Const	ruction and planning management				
Course Outcom	es:					
A		pletion of the course, Student will be able to				
	1 T.	nderstand the concepts, dimension quality and philoso	mhia	сп		
			pmes	s of T	QM.	
	2. Ur	nderstand the principles of TQM and its strategies.	pmes	s of 1	QM.	
	2. Ur 3. Ap	nderstand the principles of TQM and its strategies. pply seven statistical quality and management tools.	pines	s of 1	QM.	
	2. Un 3. Ap 4. Un	nderstand the principles of TQM and its strategies.	pmes	s of 1	QM.	



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE604		GLOBAL WARMING AND CLIMATE CHANGE	L	Т	Р	C
190201001			3	0	0	3
<b>Course Obje</b>	ctives:		1			<u>.</u>
	W	o understand the Earth's Climate System and the conce arming. o analyze the global warming and their effects due to cl	-			
	3. To	comprehend the impact of climate change on society easures.				
Unit I	INTROD	UCTION OF GLOBAL WARMING			9 Ho	ours
		w - ideal gas equation- the mole concept- sample cas of nitrogen - particulate - Green House Gases.	alcula	<mark>ition</mark>	<mark>s- pp</mark>	<mark>m -</mark>
Unit II		TREADING	AN		9 Ho	
	le from veh	of carbon dioxide emissions from power generation icle - miscellaneous source of carbon dioxide- uptake				
Unit III	<mark>OVERVI</mark> SCIENCE	EW OF CLIMATE VARIABILITY AND CLI C	MAT	<mark>`E</mark>	9 Ho	ours
•		ate change and climate prediction - the chemical and Nino and global warming - global change in recent hist		vsica	l clin	nate
Unit IV	BASICS (	OF GLOBAL CLIMATE			9 Ho	ours
		nena in the climate system - basics of radioactive for tion-land surface processes - the carbon cycle.	cing -	atm	iosph	eric
Unit V		AL PROCESSES IN THE CLIMATE SYSTEM				9 ours
		ntum-equation of state- temperature equation - con plied to moisture – saturation - wave processes in th				
		Tot	al:	4	5 Ho	ours
<b>Course Outc</b>						
	1.Outline 2. Explain 3. Illustrat	pletion of the course, Student will be able to the principle involved in the greenhouse gas emission. the carbon emission and its mitigation methods. e about the climate variability parameters. e the climate components and the circulation system.				
		about the physical processes involved in the climate s	ysten	1.		



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1903CE033	WATER P	OLLUTION AND	MANAGEMENT	L	Т	P	C
				3	0	0	3
<b>Course Objec</b>	ives:						
			ance and necessity of wa	iter			
	2. To educate abou	t the water pollution	n and its impact				
			ity analyzing techniques				
			nd management of water	r			
Unit I	WATER RESOURCES						ours
	operties of water –Water arface sources –Water Qu			Water Polic	y– Wa	ter cy	/cle–
Unit II	WATER POLLUTION	•				9 H	ours
Sources - Clas	ification, nature andToxi	cology of water pol	lutants –Ground water p	ollution-Oc	ean Po	ollutio	n by
toxic wastes- l	iver pollution-A case stud	ly	-				•
Unit III	<b>EFFECTS OF WATER</b>	POLLUTION				9 H	ours
Effects of wa	erpollutants on Human		and Economic impacts	of water p	ollutio	on–M	arine
oilpollution an	its impacts.	-		1			
Unit IV	ANALYSIS & INSTRU	<b>MENTATION</b>				9 H	ours
Analysis of	ollutants: Titrimetry -	Gravimetry – S	Spectrophotometry –	Chromatogra	aphyaı	nd F	lame
techniques.Inst	umentation: Principles an	nd Applications of	UV-VIS Spectrophotor	neter – Flan	ne Pho	otome	ter –
Atomic Absorp	tion Spectrophotometer -		y – GLC – HPLC				
Unit V	MONITORING & MA						ours
Water quality	nonitoring-Water (Preve	ention and Pollution	n Control) act 1974 -	Pollution co	ontrol	devic	es –
Polluters pay p	inciple.						
				Total:		45 H	ours
<b>Further Read</b>	ng:						
	1. Water supply engine						
	2. Waste water engine	ering					
<b>Course Outco</b>	nes:						
	After completion of the c	ourse, Student will	be able to				
	1. Illustrate about the s	ources of water and	the quality standards				
	2. Classify the nature o	f pollutants and its s	ource				
	3. Outline the effects of	f water pollution on	biodiversity				
	4. Select the suitable an	alysis technique for	the water quality param	eter estimati	on		
	5. Select the accurate n	onitoring and mana	gement methods				
<b>References:</b>		*	-				
1. Laurent H	dges – Environmental P	ollution					
	erritt and Dean – Instrur						
	nalysis of Water and Wa						
5. AIIIA-1	narysis of water and wa						



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1901HS002	INTELLECTUAL PROPERTY RIGHTS FOR L ENGINEERS	T	Р	С
	3	0	0	3
PREREQUISITE		• -		
covers traden conter	purse assumes no prior skill or background in design, art or engined the fundamental aspects of intellectual property (IP): copyright ar narks, patents, geographical indications, and industrial designs. It a nporary issues impacting the IP field such as: new plant varieties, we ement of IP rights and emerging issues in IP.	d relate lso cove	d rights rs	,
<b>COURSE OBJEC</b>				
	1. A foundation in the basic concepts of IP			
	2. Better understanding of therelationship between IP and oth health, climatechange, traditional knowledge andemerging to			such as
Module I Int	roduction		9 H	ours
	Copyright, Trademarks, Geographical Indicators, Industrial Decement of IP Rights, Emerging Issues in IP & IP Management	<mark>signs, l</mark>	Patents,	Unfair
Module II Co	pyrights & Trademarks		6 H	ours
The concept, Cas Formats & Filing I	e Study, Historical background, Principles, Notion of Work, R Procedures	ights ar	nd Lim	itations
	ographical Indicators & Industrial Designs		6 H	ours
	e Study, Historical background, Principles, Notion of Work, R	ights ar	id Lim	itations
	e Study, Historical background, Principles, Notion of Work, R rocedures	ights ar	id Lim	itations
Formats& Filing P Module IV Pate The Macro-Econo	rocedures nts nic Impact of the Patent System, The Patent Application Process	, The D	15 I	Hours Layers
Formats& Filing P Module IV Pate The Macro-Econo of the Internation Property Protection New Issues, Impor	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and	, The D Kinds Process	15 I ifferent of Inte , Enfor	Hours t Layers ellectua cement
Formats& Filing P Module IV Pate The Macro-Econo of the Internation Property Protectio New Issues, Impor Patents, Patent Sea	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch	, The D Kinds Process	15 I ifferent of Inte , Enfor Doma	<b>Jours</b> t Layers ellectual cement, in under
Formats& Filing PModule IVPateThe Macro-Econoof the InternationProperty ProtectionNew Issues, ImporPatents, Patent SeaModule VPateWhat is PCT? Us	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty re of PCT, Preparing a PCT Application, PCT Services, Paten	, The D Kinds Process I Public	15 I ifferent of Inte Enfor Domai	Hours t Layers ellectual cement in under ours
Formats& Filing PModule IVPateThe Macro-Econoof the InternationProperty ProtectionNew Issues, ImporPatents, Patent SeaModule VPateWhat is PCT? Us	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty	, The D Kinds Process I Public	15 I ifferent of Into Enfor Domain Domain 9 H and C	Hours t Layers ellectua cement in under ours commor
Formats& Filing P         Module IV       Pate         The Macro-Econo       of the Internation         of the Internation       Property Protection         Property Protection       New Issues, Impor         Patents, Patent Sea       Module V         Patents, Patent Sea       Module V         What is PCT?       Us         Representatives, In       Explain va         1.       Explain va         2.       Explain ba	nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty is of PCT, Preparing a PCT Application, PCT Services, Paten ternational Search, International Examination rious types of IPRs specific to Engineering ncepts such as Copyrights, Trademarks, GIs and Industrial designs sic concepts of Engineering Patents	, The D Kinds Process d Public t Agent TOTA	15 I ifferent of Into Enfor Domain Domain 9 H and C	Hours t Layers ellectual cement, in under ours
Formats& Filing P         Module IV       Pate         The Macro-Econo       of the Internation         of the Internation       Property Protection         New Issues, Impor       Patents, Patent Sea         Module V       Pate         What is PCT?       Us         Representatives, In       Course Outcomess         1.       Explain va         2.       Explain co         3.       Explain co         4.       Explain co	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty e of PCT, Preparing a PCT Application, PCT Services, Paten tternational Search, International Examination rious types of IPRs specific to Engineering ncepts such as Copyrights, Trademarks, GIs and Industrial designes sic concepts of Engineering Patents ncept of Patent Search and various methods to do it	, The D Kinds Process d Public t Agent TOTA	15 I ifferent of Into Enfor Domain Domain 9 H and C	Hours t Layers ellectua cement in under ours commor
Formats& Filing P         Module IV       Pate         The Macro-Econo       of the Internation         Property Protection       New Issues, Import         Property Protection       New Issues, Import         Patents, Patent Seat       Module V         Patents, Patent Version       Pate         What is PCT? Us       Representatives, In         Course Outcomest       1. Explain va         2. Explain to       3. Explain co         3. Explain co       5. Develop a	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty e of PCT, Preparing a PCT Application, PCT Services, Paten tternational Search, International Examination rious types of IPRs specific to Engineering ncepts such as Copyrights, Trademarks, GIs and Industrial designs sic concepts of Engineering Patents ncept of Patent Search and various methods to do it sample PCT Application and explain examination procedures	, The D Kinds Process d Public t Agent TOTA	15 I ifferent of Into Enfor Domain Domain 9 H and C	Hours Layers ellectua cement in under ours
Formats& Filing P         Module IV       Pate         The Macro-Econo       of the Internation         Property Protection       New Issues, Import         Property Protection       New Issues, Import         Patents, Patent Seat       Module V         Patents, Patent Vertex       Pate         What is PCT?       Ust         Representatives, In       Explain variable         1.       Explain co         3.       Explain co         4.       Explain co         5.       Develop a         FURTHER READ       1.	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty e of PCT, Preparing a PCT Application, PCT Services, Paten ternational Search, International Examination rious types of IPRs specific to Engineering ncepts such as Copyrights, Trademarks, GIs and Industrial designs sic concepts of Engineering Patents ncept of Patent Search and various methods to do it sample PCT Application and explain examination procedures ING: Intellectual Property Rights by PandeyNeeraj&DharniKhushdee Fundamentals of IPR: for students, Industrialist and patent lawyor	, The D Kinds Process I Public t Agent TOTA	15 I ifferent of Into , Enfor Doma:   9 H and C L: 45	Hours t Layers ellectua cement in under ours formmor HOURS
Formats& Filing P         Module IV       Pate         The Macro-Econo       of the Internation         Property Protection       New Issues, Impor         Property Protection       New Issues, Impor         Patents, Patent Sea       Module V       Pate         Module V       Pate       Pate         What is PCT?       Us         Representatives, In       Explain va         2.       Explain co         3.       Explain co         4.       Explain co         5.       Develop a         FURTHER READ       1.	nts nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty e of PCT, Preparing a PCT Application, PCT Services, Paten tternational Search, International Examination rious types of IPRs specific to Engineering ncepts such as Copyrights, Trademarks, GIs and Industrial designs sic concepts of Engineering Patents ncept of Patent Search and various methods to do it sample PCT Application and explain examination procedures ING: Intellectual Property Rights by PandeyNeeraj&DharniKhushdeed	, The D Kinds Process I Public t Agent TOTA	15 I ifferent of Into , Enfor Doma:   9 H and C L: 45	Hours t Layers ellectua cement in under ours formmor HOURS
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Formats& Filing PModule IVPateThe Macro-Econoof the InternationProperty ProtectionNew Issues, ImporPatents, Patent SeaModule VPateWhat is PCT? UsRepresentatives, InCourse Outcomes:1.Explain va2.Explain va3.Explain co3.Explain co5.Develop aFURTHER READ1.Law relating to I	nis Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty e of PCT, Preparing a PCT Application, PCT Services, Paten iternational Search, International Examination rious types of IPRs specific to Engineering ncepts such as Copyrights, Trademarks, GIs and Industrial designs sic concepts of Engineering Patents ncept of Patent Search and various methods to do it sample PCT Application and explain examination procedures ING: Intellectual Property Rights by PandeyNeeraj&DharniKhushdee Fundamentals of IPR: for students, Industrialist and patent lawyor Anil Kumar HS, 2017Drucker	, The D Kinds Process d Public t Agent TOTA TOTA	15 I ifferent of Into , Enfor Doma:   9 H and C L: 45	Hours t Layers ellectua cement in unde ours formor HOURS
Formats& Filing PModule IVPateThe Macro-Econoof the InternationProperty ProtectionNew Issues, ImporPatents, Patent SeaModule VPateWhat is PCT? UsRepresentatives, InCourse Outcomest1.Explain va2.Explain to3.Explain to4.Explain co5.Develop aFURTHER READ1.Law relating to I2.Introduction to Im	nis nic Impact of the Patent System, The Patent Application Process al Patent System and Regional Patent Protection Mechanisms, n Based on Types of Inventions, Legal Issues of the Patenting tant Cases and Discussions, IP and Development - Flexibilities and rch nt Cooperation Treaty te of PCT, Preparing a PCT Application, PCT Services, Paten iternational Search, International Examination rious types of IPRs specific to Engineering ncepts such as Copyrights, Trademarks, GIs and Industrial designs sic concepts of Engineering Patents ncept of Patent Search and various methods to do it sample PCT Application and explain examination procedures <b>ING:</b> Intellectual Property Rights by PandeyNeeraj&DharniKhushdee Fundamentals of IPR: for students, Industrialist and patent lawye Anil Kumar HS, 2017Drucker PR by Dr MK Bandarai, Central Law Publication, 2014	, The D Kinds Process d Public t Agent TOTA TOTA	15 I ifferent of Into , Enfor Doma:   9 H and C L: 45	Hours t Layer ellectua cement in unde ours formor HOURS



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1901HS006	6	DESIGN THINKING FOR INNOVATION	L	Т	P	C
			3	0	0	3
DDEDEAU	ICITE.					
PREREQU		rse assumes no prior skill or background in design, art, engined	oring c	r protot	uning	Itic
		all undergraduates and graduate students with an interest in lea				
		y recommended for those students planning social-venture and				
	intervent			Rinus e	1 40015	
COURSE C						
		erstand how teaching and learning occurs in the design process	S			
F		ognize the ethical and social dilemmas and obligations of the p		of desi	gn	
-		nose common adoption barriers in individuals, groups and org			-	
-	-	elop a design theory from independent and qualitative research			ons	
-		cipate in and lead innovation in creative and collaborative sett				
-		ertake complex and unstructured problem-solving challenges i	-	miliar d	omains	
	0. 0.14					
Module I	Introd	uction to Design Thinking			8 H	ours
	ntered De	sign, Why Design Thinking, 5-Step Design Thinking Pro	cess, A	Applicat		
		ure of Innovation				
Module II	Desigr	I Thinking Approach			12 H	Iours
IDEO's me	thod of I	Design Thinking, Divergent Thinking & Innovation Funnel,	, Custo	mer Jo	urney ]	Maps 1
uncover Inn	ovation (	Opportunities, Case Study : Turing Creative Ideas into Viab	le Cor	npanies		•
Module III	<b>Expl</b>	oring Design Thinking ToolKit			5 H	ours
Discovery,	Interpreta	tion, Ideation, Experimentation, Evolution				
		I Challenge Project: Phase-1			5 H	ours
Define a Ch	allenge,	Project Plan, How Might We statement, Project Timeline, F	Project	Checkl	ist	
Module V		I Challenge Project: Phase-2				Hours
		and the Challenge, Prepare Research, Gather Inspiration, 1				
	U	, Frame Opportunities, Ideation – Generate Ideas, Refin	e Idea	s, Expo	erimen	tation
Make Proto	types, Ge	et Feedback, Evolution – Track Learnings, Engage Others				
<u>C</u>				TOTA	L: 45	HOUR
Course Out		epts and basics of Design Thinking Principles				
		in Thinking Approach through IDEO's method & Customer Jo	urneu	Mans		
		views and synthesize learnings to uncover insights and identify			for inn	ovatio
		iven Innovative Solutions to RealWorld Problems	oppor	unnies	IOI IIII	0 v atio
FURTHER						
		for Social Impact: How to by IDEO.org				
		Thinking ToolKit by IDEO.org				
		eld guide to Human Centered Design by IDEO.org				
REFEREN	CES:					
1.Creative C	Confidence	e: Unleashing the Creative Potential Within Us AllBook by Da	avid M	. Kelley	and To	om
Kelley, 2013	3					
		How Design Thinking Transforms Organizations and Inspires	Innova	ation		



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1901MGX07	-	UNIVERSAL HUMAN VALUES & ETHICS	L 3	<u>Т</u> 0	P 0	<u>C</u> 3
Course Objec	tives:		5	0	U	5
	<ol> <li>To he basic gu</li> <li>To he 'really w</li> <li>To he being.</li> <li>To far and live</li> <li>To far</li> </ol>	Ip students distinguish between values and skills, and un idelines, content and process of value education. Ip students initiate a process of dialog within themselves rant to be' in their life and profession Ip students understand the meaning of happiness and pro- cilitate the students to understand harmony at all the leve accordingly. cilitate the students in applying the understanding of harm fession and lead an ethical life	to kn sperit <u>y</u> els of	ow v y for huma	what a hu an liv	hey nan ing,
Unit I	Course	Introduction - Need, Basic Guidelines, Content an	d		9 H	mrs
Cint I		for Value Education	u		/ 11	Juis
look at basic the basic req priority - Uz current scena	Human L uirement nderstand trio - Met	chanism for self-exploration - Continuous Happiness Aspirations - Right understanding, Relationship and F s for fulfillment of aspirations of every human being ing Happiness and Prosperity correctly- A critical hod to fulfill the above human aspirations: understan	Physic g with l app	cal F nthei raisa	acilit r cor l of	ies- rect the
harmony at w	arious les	1				
•						
Unit II	<mark>Unders</mark> Myself	tanding Harmony in the Human Being - Harmony		rial	9 H	
Unit II Understanding Understanding instrument of of 'I' and har	Unders Myself g human g the need 'I' (I bein mony in '		mate ding t ristics	he Bo and and S	'Body ody a activ Swast	/'- s an ities nya;
Unit II Understanding Understanding instrument of of 'I' and har correct apprai	Unders Myself g human g the need 'I' (I bein mony in ' sal of Phy Unders	tanding Harmony in the Human Being - Harmony being as a co-existence of the sentient 'I' and the s of Self ('I') and 'Body' - Sukh and Suvidha - Understand g the doer, seer and enjoyer) - Understanding the characte I' - Understanding the harmony of I with the Body: San sical needs, meaning of Prosperity in detail - Programs to tanding Harmony in the Family and Society- Harn	mate ding t ristics yam a ensur	he B and and S e Sai	'Body ody a activ Swast	/'- s an ities nya; and
Unit II Understanding Understanding instrument of of 'I' and har correct apprain Swasthya Unit III Understanding human-human Trust (Vishwa meaning of V of Samman, D Understanding family): Sama universal har	Unders Myself g human g the need 'I' (I bein mony in ' sal of Phy Unders in Hum g harmony n relationsl s) and Rea ishwas; D offference g the dhan, San monious	<b>tanding Harmony in the Human Being - Harmony</b> being as a co-existence of the sentient 'I' and the s of Self ('I') and 'Body' - Sukh and Suvidha - Understand g the doer, seer and enjoyer) - Understanding the character I' - Understanding the harmony of I with the Body: San sical needs, meaning of Prosperity in detail - Programs to	mate: ding t ristics yam a ensur nony erstan sure t - Und anding s in re als -	he B and S e San ding <i>Ubha</i> ersta the lation xtens Visu	<sup>•</sup> Body ody a activ Swast nyam <b>10 Ho</b> value <i>y-trip</i> nding mean ship sion alizin	y' - s an atties nya; and <b>burs</b> s in <i>ti</i> ; the ning of g a
Unit II Understanding Understanding instrument of of 'I' and har correct apprain Swasthya Unit III Understanding human-human Trust (Vishwa meaning of V of Samman, D Understanding family): Sama universal har	Unders Myself g human g the need 'I' (I bein mony in ' sal of Phy Unders in Hum g harmony n relationsl s) and Re: ishwas; D bifference g the dhan, San monious Vyawastha Unders	tanding Harmony in the Human Being - Harmony being as a co-existence of the sentient 'I' and the s of Self ('I') and 'Body' - Sukh and Suvidha - Understand g the doer, seer and enjoyer) - Understanding the characte I' - Understanding the harmony of I with the Body: San sical needs, meaning of Prosperity in detail - Programs to tanding Harmony in the Family and Society- Harm an-Human Relationship in the Family- the basic unit of human interaction - Under tip; meaning of Nyaya and program for its fulfillment to en- spect (Samman) as the foundational values of relationship ifference between intention and competence - Understand between respect and differentiation; the other salient values harmony in the society (society being an aridhi, Abhay, Sah-astitva as comprehensive Human Goa order in society- Undivided Society (AkhandSamaj) -) from family to world family! tanding Harmony in the Nature and Existence - W	mate ding t ristics yam a ensur nony erstan sure t - Und anding s in re als - 0, Un	he B and S e San ding <i>Ubha</i> ersta the lation xtens Visu	<sup>•</sup> Body ody a activ Swast nyam <b>10 Ho</b> value <i>y-trip</i> nding mean ship sion alizin	t'' - s an ities nya; and <b>burs</b> ti; the hing of g a rder
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Unit II Understanding Understanding instrument of of 'I' and har correct apprain Swasthya Unit III Understanding human-human Trust (Vishwa meaning of V of Samman, D Understanding family): Sama universal har (Sarvabhaum) Unit IV Understanding orders of natu	Unders Myself g human g the need 'I' (I bein mony in ' sal of Phy Unders in Hum g harmony relationsl s) and Re: ishwas; D ifference g the dhan, San monious Vyawastha g the harm re- recycla of mutuall	tanding Harmony in the Human Being - Harmony being as a co-existence of the sentient 'I' and the s of Self ('I') and 'Body' - Sukh and Suvidha - Understand g the doer, seer and enjoyer) - Understanding the characte I' - Understanding the harmony of I with the Body: San sical needs, meaning of Prosperity in detail - Programs to tanding Harmony in the Family and Society- Harm an-Human Relationship in the Family- the basic unit of human interaction - Unden ip; meaning of Nyaya and program for its fulfillment to en- spect (Samman) as the foundational values of relationship ifference between intention and competence - Understan- between respect and differentiation; the other salient values harmony in the society (society being an arridhi, Abhay, Sah-astitva as comprehensive Human Goa order in society- Undivided Society (AkhandSamaj) ) - from family to world family! tanding Harmony in the Nature and Existence - W ce as Co-existence	mate: ding t ristics yam a ensur ensur erstan sure t - Und anding s in re als - 0, Un <b>'hole</b> nent a ence as	he Bo and S e San ding Ubha ersta g the lation xtens Visu ivers	<sup>•</sup> Body ody a activ Swast nyam <b>10 Ho</b> value <i>y-trip</i> nding mean sion alizin al O <b>9 Ho</b> existe	y' - s an ities nya; and <b>ours</b> s in <i>ti</i> ; the ning of g a rder ours four s



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Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order:a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers - b) At the level of society: as mutually enriching institutions and organizations

		Total:	45 Hours
Further Proceeding:			
1.	Analysis about Code of Conduct for Ethical & Moral	values	
Course Outcomes:			
	mpletion of the course, Student will be able to		
1. Und	erstand the significance of value inputs in a cla	ssroom and s	start applying
them in	their life and profession		
2. Dist	inguish between values and skills, happine	ss and accu	umulation of
physica	l facilities, the Self and the Body, Intention	and Comp	etence of an
individ	ual, etc.		
3. Und	erstand the value of harmonious relationship ba	ased on trust	and respect
in their	life and profession		
4. Und	erstand the role of a human being in ensuring	g harmony ii	n society and
nature.		-	-
5. Dist	inguish between ethical and unethical practic	es, and start	working out
the stra	tegy to actualize a harmonious environment wh	nerever they	work.
References:			
	nVidyaEkParichay, Divya Path Sansthan, Amarkanta		
	990, Science and Humanism, Commonwealth Publish	ers.	
* *	uman Values, New Age International Publishers.		
4. Ivan Illich, 1974, Ener	gy & Equity, The Trinity Press, Worcester, and Harpe	er Collins, US	A



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	COASTAL ZONE MANAGEMENT	3	0	0	3
	At the end of the semester, 1.The student shall be able to understand the coastal processes	1			
Course Objectives:	2. The student shall be able to understand the coastal dynamics				
Ū	3.The student shall be able to understand impacts of structures like do quays leading to simple management perspectives along the coastal zo		arbors	and	
Unit I	COASTAL ZONE			9 H	ours
Coastal zone	- Coastal zone regulations - Beach profile - Surf zone - Off shore - Coastal	water	s – E	stuari	es —
	d Lagoons – Living resources – Nonliving resources.				
	WAVE DYNAMICS			9 H	
	cation – Airy's Linear Wave theory – Deep water waves – Shallow water wa yy – Wave Decay – Reflection, Refraction and Diffraction of waves – Breaki				
	tures – Vertical – Sloping and stepped barriers – Force on piles.	8			
	WAVE FORECASTING AND TIDES			9 H	ours
	casting - SMB and PNJ methods of wave forecasting - Classification of tide	s – Da	arwin	's	
equilibrium th	neory of tides – Effects on structures – seiches, Surges and Tsunamis.				
Unit IV	COASTAL PROCESSES			9 H	
	lepositional shore features – Methods of protection – Littoral currents – Coas	stal aq	uifers		
Erosion and d water intrusio	lepositional shore features – Methods of protection – Littoral currents – Coas n – Impact of sewage disposal in seas.	stal aq	uifers	– Sea	L
Erosion and d water intrusio Unit V	lepositional shore features – Methods of protection – Littoral currents – Coas n – Impact of sewage disposal in seas. HARBOURS			– Sea 9 He	ours
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Erosion and d water intrusio Unit V Structures nea Selection of d Further Read Course Outc	lepositional shore features – Methods of protection – Littoral currents – Coase         on – Impact of sewage disposal in seas.         HARBOURS         ar coast – Selection of site – Types and selection of break waters – Need and         lredgers – Effect of Mangalore Forest.         Tot         ding:         1.Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scien         1999         2.Quinn, A.D., "Design & Construction of Ports and Marine Structures", Methods Co., 1999         omes:         After completion of the course, Student will be able to         1. Describe the Coastal zone regulations,         2. Describe the coastal processes         3. Explain the wave dynamics and forecast waves         4. Understand the erosion and depositional shore protection         5. Plan the coastal structures including harbours and tides	mode al:	of dr Publis	– Sea 9 Ho edgin 45 Ho	urs g – ours
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#### ME ENVIRONMENTAL ENGINEERING

2102EV104		ENVIRONMENTAL CHEMISTRY		L	Т	Р	C			
				3	0	0	3			
Course Obje	ectives:									
	1. To edu	acate the students about water chemistry								
	2. To imp	part knowledge in the area of air and soil chemistry								
	3. To im	part knowledge on the transformation of chemicals in	the env	ironı	nent					
Unit I	Introducti					9 Ho				
Stoichiometry and mass balance-Chemical equilibrium, acid base, solubility product (Ksp), heavy metal										
precipitation, amphoteric hydroxides, CO2 solubility in water and species distribution - Chemical										
kinetics, First		rinciples of green chemistry.								
Unit II	Aquatic C					11 Ho				
		- environmental significance and determination; Fate c					c			
environment,		tion, partitioning, hydrolysis, photochemica								
		chemicals-Metals, complex formation, oxidation and r								
		corption- Colloids, electrical properties, double layer the	heory, e	envir	onme	ental				
significance of		<u> </u>								
Unit III		ric Chemistry				7 Ho	ours			
		chemical and photochemical reactions - photochemica					_			
		ases and global warming, CO2 capture and sequestration	on – Ac	id ra	in- o	igin	and			
-	-	es. Air quality parameters-effects and determination.								
Unit IV	Soil Chem			_		9 Ho				
		of soil-Clays- cation exchange capacity-acid base and i								
		cals in soil-Reclamation of contaminated land; salt by	leachin	g-He	eavy 1	netal	s by			
electrokinetic										
Unit V		ental Chemicals		• •		9 Ho	ours			
		peciation –Speciation of Hg &As- Organic chemicals-								
		endocrine disruptors and their Toxicity- Nano materia	ils, CN	I, tit	anıa,					
composites, e	environmenta	al applications.								
			Tota	l:	2	15 Ho	ours			
Further Rea	ding									
		and create a solution for environmental issues.								
Course Outo										
	1	bletion of the course, Student will be able to								
1	-	guish the chemistry involved								
		stand the chemistry involved in water								
		y and solve the air pollution related issues								
1		stand the soil related chemistry and issues								
		y contaminating chemicals and can work out chemic	cals ne	ed c	alcula	tions	for			
1		ent purpose								



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2102EV102		ENVIRONMENTAL MICROBIOLOGY	L	Т	Р	С
			3	0	0	3
Course Obje						
		urse provides a basic understanding on microbiology relevan	nt to	envir	onme	ental
		ring for candidates with little prior knowledge of the subject.				
		orphology, behavior and biochemistry of bacteria, fungi, pro	otozoa	, vir	uses,	and
		re outlined.				
		crobiology of wastewater, sewage sludge and solid waste treater				
		rovided. Aspects on nutrient removal and the transmission	of di	isease	e-cau	sing
-		sms are also covered.				
-		osure to toxicology due to industrial products and byproducts				
		urse provides a basic understanding on microbiology relevar	nt to	envir	onme	ental
		ering for candidates with little prior knowledge of the subject.				
Unit I		on And Characteristics			5 Ho	
		anisms – prokaryotic, eukaryotic, cell structure, characteristics	s, Pres	ervat	tion o	t
		NA, replication, Recombinant DNA technology.				
Unit II		And Nutrient Cycles			10 Ho	
		nisms – Distribution / diversity of Microorganisms – fresh and			rrestr	ıal
		Air – outdoor and Indoor, aerosols, biosafety in Laboratory –				
		eria – Significance in water supplies – problems and control. T				
		cyclesHydrological - Nitrogen, Carbon, Phosphorus, Sulpl	hur, C	ycle	– Ro	le
of Micro Orga						
Unit III		n of Microorganisms	1 .		10 Ho	ours
		in microorganisms, growth phases, carbohydrate, protein, lipid				
respiration, ac	erobic and an	aerobic-fermentation, glycolysis, Kreb"s cycle, hexose monop				
						ay,
electron trans	port system,	oxidative phosphorylation, environmental factors, enzymes, B		rgeti	cs.	
electron trans Unit IV	port system, Pathogens	oxidative phosphorylation, environmental factors, enzymes, B in Wastewater	ioene	rgetio	cs. 10 Ho	ours
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	synth	etic products in the environment.
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Course Ob	jectives:						
		cate the students in detailed design con-		r trans	missi	on m	ains,
		listribution system, sewer networks and					
		cate the students in computer application	n on design.				
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		ow – continuity principle, energy principlessure flow, minor heads losses, Carrying			ent.		
Unit II		nsmission and Distribution vater and wastewater-Planning of Water				10 H	ours
networks D	Design, an es – leak d	inting, laying and maintenance, water ha sis and optimization – appurtenances – c ction Storage reservoirs.					
Unit III	Wastew	er Collection and Conveyance				10 H	ours
	ce of sewe	pumping stations- sewer appurtenances; Design of sewer outfalls-mixing condition				n and	
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maintenance wastewater Unit IV Necessity- intensity du Unit V Use of com LOOP vers	ce of sewe rs. Storm V - combine aration an Case St puter soft sion 4.0, S eading Designi itcomes:	Design of sewer outfalls-mixing conditions ter Drainage and separate system; Estimation of storm requency relationships- Rational methods ies and Software Applications re in water transmission, water distribution VER, BRANCH, Canal ++ and GIS base of pipelines and sewers for various projections	ons; conveyance of c n water run-off Formu s. ion and sewer design ed softwares. <b>To</b> ect areas	orrosiv Ilation – EPA	of ra	<b>7 H</b> infall <b>10 H</b> 2.0,	ours
maintenance wastewater Unit IV Necessity- intensity du Unit V Use of com LOOP vers Further Re	ce of seweers.          Storm V         - combined aration an aration an aration an aputer softsion 4.0, S         eading         Designi         tcomes:         After co	Design of sewer outfalls-mixing conditients ter Drainage and separate system; Estimation of storm requency relationships- Rational methods ies and Software Applications re in water transmission, water distribution VER, BRANCH, Canal ++ and GIS base of pipelines and sewers for various projection poletion of the course, Student will be ablected	ons; conveyance of c n water run-off Formu s. ion and sewer design ed softwares. <b>To</b> ect areas	orrosiv Ilation – EPA	of ra	<b>7 H</b> infall <b>10 H</b> 2.0,	ours
maintenance wastewater Unit IV Necessity- intensity du Unit V Use of com LOOP vers Further Re	ce of seweers.          Storm V         - combined aration an aration an aration an aputer softsion 4.0, S         eading         Designing         After cc         1. Unco	Design of sewer outfalls-mixing conditient ter Drainage and separate system; Estimation of storm requency relationships- Rational methods ies and Software Applications re in water transmission, water distribution VER, BRANCH, Canal ++ and GIS base of pipelines and sewers for various projection of the course, Student will be ablected trand the fluid flow properties	ons; conveyance of c n water run-off Formus. ion and sewer designed softwares. <b>To</b> ect areas	orrosiv Ilation – EPA	of ra	7 Ho infall 10 Ho 2.0, 45 Ho	ours
maintenance wastewater Unit IV Necessity- intensity du Unit V Use of com LOOP vers Further Re	ce of seweers.          Storm V         - combineduration an         Case St         mputer softsion 4.0, S         cading         Designi         itcomes:         After cc         1. Unc         2. Des	Design of sewer outfalls-mixing condition ter Drainage and separate system; Estimation of storm requency relationships- Rational methods ies and Software Applications re in water transmission, water distribution VER, BRANCH, Canal ++ and GIS base of pipelines and sewers for various projection pletion of the course, Student will be ablected tand the fluid flow properties water supply main, distribution network	ons; conveyance of c n water run-off Formus. ion and sewer designed softwares. <b>To</b> ect areas	orrosiv Ilation – EPA	of ra	7 Ho infall 10 Ho 2.0, 45 Ho	ours
maintenance wastewater Unit IV Necessity- intensity du Unit V Use of com LOOP vers Further Re	ce of sewers.          Storm         - combineduration an         Case St         nputer soft         sion 4.0, S         eading         Designi         Itcomes:         After cc         1. Und         2. Des         3. Des	Design of sewer outfalls-mixing condition ter Drainage and separate system; Estimation of storm requency relationships- Rational methods ies and Software Applications re in water transmission, water distribution VER, BRANCH, Canal ++ and GIS base of pipelines and sewers for various projection of the course, Student will be ablected tend the fluid flow properties water supply main, distribution network the drainage network for wastewater	ons; conveyance of c n water run-off Formus. ion and sewer designed softwares. <b>To</b> ect areas	orrosiv Ilation – EPA	of ra	7 Ho infall 10 Ho 2.0, 45 Ho	ours ours
maintenance wastewater Unit IV Necessity- intensity du Unit V Use of com LOOP vers Further Re	ce of sewers.          Storm V         - combined aration an example of several aration an example of sign and the second several aration and the several aration are several aration and the several aration are several aration and the several aration are several are severa are several are severa	Design of sewer outfalls-mixing condition ter Drainage and separate system; Estimation of storm requency relationships- Rational methods ies and Software Applications re in water transmission, water distribution VER, BRANCH, Canal ++ and GIS base of pipelines and sewers for various projection pletion of the course, Student will be ablected tand the fluid flow properties water supply main, distribution network	ons; conveyance of c n water run-off Formus. ion and sewer design of softwares. <b>To</b> ect areas e to k and sewer for vario	ulation - EPA tal:	of ra	7 He infall 2.0, 45 He dition	Durs Durs S



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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2102EV103		PRINCIPLES AND DESIGN OF PHYSICO- CHEMICAL TREATMENT SYSTEMS	L	Т	Р	C
			3	0	0	3
<b>Course Object</b>	tives:					
	1.	To educate the students on the principles and process designs systems for water and wastewater				
		To educate the students on design of treatment systems comprising such systems, leading to the selection of specific p			mpor	ents
Unit I	Intr	oduction			5 H	ours
		l wastewater - characteristics, Standards for performance - Si				
chemical treatr kinetics.	ment —	Selection criteria-types of reactors- reactor selection-batc	h- co	ntinu	<mark>ous t</mark>	ype-
Unit II	Trea	atment Principles			10 He	ours
Physical treatm	nent - S	Screening – Mixing, Equalization – Sedimentation – Filtrat	ion –	Evap	oratio	on –
Reverse Osmo stripping and flocculation –	osis, nai crystall Precipi	nsfer – mass transfer coefficient Adsorption – Isotherms – M no filtration, ultra-filtration and hyper filtration electro di ization – Recent Advances. Principles of Chemical treat tation – flotation solidification and stabilization – Disinfer Solvent extraction – advanced oxidation /reduction – Recent Tr	alysis, ment ction,	dist – Co	illatic agula	on – ation
Unit III		ign of Municipal Water Treatment Plants	entab		10 He	nurs
	nd O&N	Displacement and gaseous type - Flow charts – Layouts – Hyd 1 aspects – case studies, Residue management – Upgradation				
Unit IV		ign of Industrial Water Treatment Plants			10Ho	
		Vater Treatment Units- Selection of process - Design of softer				
		ntsFlow charts Layouts Hydraulic Profile, PID - cor			nd O	&M
aspects – case s		Residue management – Upgradation of existing plants – Recen	nt Trei	nds.		
Unit V		ign of Wastewater Treatment Plants			10 He	
thickening-slud Units-Equalizat charts – Layou	lge dew tion- Ne ıts –Hyc	wastewater treatment units-screens-detritors-grit chamber-sc atering systems-sludge drying beds - Design of Industrial W eutralization-Chemical Feeding Devices-mixers- floatation un draulic Profile, PID, construction and O&M aspects – case s - Upgradation of existing plants – Recent Trends.	/astew its-oil	ater ' skim	Freatı mer H	nent Flow
		То	tal:		45 H	ours
Further Readi						
<u> </u>	1	lementation of advanced treatment technologies for various wa	istewa	ter tro	eatme	nt
Course Outcon	mes:					
	1.0					
	-	r completion of the course, Student will be able to				
	1.	Identify the pollutants type in the wastewater				
	1. 2.	Identify the pollutants type in the wastewater Understand the various treatment principles				
	1. 2. 3.	Identify the pollutants type in the wastewater Understand the various treatment principles Design the sewage treatment plants				
	1. 2. 3. 4.	Identify the pollutants type in the wastewater Understand the various treatment principles				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

2102EV105		ENVIRONMENTAL CHEMISTRY	Y	L	T	Р	C
	-	LABORATORY		0	0	2	1
Course Object	ives:			U	U	4	
<u>course object</u>		rain in the analysis of physical parame	eters of water and wa	aste wat	er		
		train in the analysis of chemical param					
List of Experim							
		ctices, Quality control, calibration of C	Glassware				
		sis of water (pH, alkalinity, hardnes		e, turbi	dity H	EC, 1	<b>FDS</b>
nitrate, fluo			<i>,</i> 1	,	5	,	
		BOD, COD, Phosphate, TKN, Oil &	Grease, Surfactant a	nd heav	y met	als).	
4. Sampling a	nd analys	s of air pollutants Ambient & Stack (1	RSPM, SO2 and NC	<mark>)x)</mark>			
5. Sampling a	nd chara	erization of soil (CEC & SAR, pH and	d K).				
				Tot	al: 🔤	45 H	our
<b>Course Outco</b>	mes:						
	After c	mpletion of the course, Student will be	e able to				
	1. ass	ss quality of environment					
	2. co	duct analysis on characteristics of wat	ter and waste water				
<b>References:</b>							
1. APHA, Sta	ndard Me	hods for the Examination of Water and	d Wastewater, 21st ]	Ed.			
2. Washington	n, 2005.						
3. Laboratory	Manual	r the Examination of water, wastewate	er soil Rump, H.H. a	and Kris	st, H.		
4. Second Ed	ition, VC	, Germany, 1992.					
5. Methods publishers,		ampling & analysis, James P.I 989.	Lodge Jr(Editor)	3rd E	dition	, L	ewi



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

2102EV103		PRINCIPLES AND DESIGN OF BIOLOGICAL	L	Τ	P	C
		TREATMENT SYSTEMS	3	0	0	3
Course Obje	 ctives:		5	U	U	5
<u>course objec</u>		ate the students on the principles and process designs of vario	us trea	atmen	t svst	ems
		er and wastewater and students should gain competency in the				
		of treatment systems and the components comprising such syst	1			
	-	n of specific process.	,		0	
Unit I	Introdu				10 He	ours
Objectives of	biologica	l treatment – significance – Principles of aerobic and anaerobi	c treat	ment	- kin	etics
of biological g	growth – J	Factors affecting growth – attached and suspended growth - De	etermi	natio	<mark>n of</mark>	
Kinetic coeffi	cients for	organics removal - Biodegradability assessment -selection of	proce	ss- re	actors	5-
batch-continu	<mark>ous type.</mark>					
Unit II	Aerobio	c Treatment of Wastewater			10 He	
		nent plant units – Activated Sludge process and variations, Sec	uenci			Jui
		ological Reactors-Trickling Filters-Bio Tower-RBC-Moving E				
		aerated lagoons, waste stabilization ponds – nutrient removal s				
treatment syst	ems, cons	structed wet land – Disinfection – disposal options – reclamati	on and	l reus	e - F	low
charts, layout,		lraulic profile, recent trends.				
Unit III		bic Treatment of Wastewater			10 He	
		d growth, Design of units – UASB, up flow filters, Fluidized b				
		trient removal systems – Flow chart, Layout and Hydraulic pro	ofile –	Rece		
Unit IV		Treatment and Disposal		<u>.                                    </u>	<u>5 Ho</u>	
		gement facilities, sludge thickening, sludge digestion, biogas g				3
		l and gravity) Layout, PID, hydraulics profile – upgrading exis al – recent advances.	sung p	lants	_	
Unit V		uction Operations and Maintenance Aspects			10 He	nur
		ational Maintenance problems – Trouble shooting – Planning,	Organ			Juis
		erations – capacity building - Retrofitting Case studies – sewag				ts –
sludge manag					r	
<u> </u>		To	tal:		45 H	ours
Course Outco	omes:					
		ompletion of the course, Student will be able to				
	1. Dev	relop conceptual schematics required for biological treatment of	of was	tewat	er	
	2. Tra	nslate pertinent criteria into system requirements.				
References:						
	, S.J., W	astewater Treatment for Pollution Control, TMH, New De	lhi, S	econd	l Edi	tion
2000.						
		erage and Sewage Treatment" CPHEEO, Ministry of U	Jrban	Deve	elopn	ient
		ia, New Delhi, 1999.	<u>,1 5 1</u>	• . •	<b>T</b> :	1.5
		NC, "Wastewater Engineering – Treatment and Reuse, Four	th Ed	ition,	Tata	M
		ng Company Limited, New Delhi, 2003.			1 1 1	L
-		nd Book of Water and Wastewater Treatment Plant operation	ns, Cl	C Pi	ess, I	Nev
York (200	17).					



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

2103EV004		AIR POLLUTION MONITORING AND CONTROL	L	Т	P	С
			3	0	0	3
Course Object						
		part knowledge on the principles and design of control of				
		r/particulate/gaseous air pollutant and its emerging trends				
Unit I		duction			7 H	ours
		ion of Atmosphere – Sources and classification of air pollutar				
<mark>pollutants on hu</mark>	ıman he	alth, vegetation & animals, Materials & Structures – E	ffects of	of air		
Pollutants on th	e atmos	phere, Soil & Water bodies – Long- term effects on the plane	t – Glo	bal C	limat	e
Change, Ozone	Holes -	- Ambient Air Quality and Emission Standards – Air Pollution	1 Indic	es – I	Emiss	ion
Inventories – Ar	mbient a	and Stack Sampling and Analysis of Particulate and Gaseous	Polluta	nts.		
Unit II	Air P	ollution Modelling			5 He	ours
Effects of meteo	orology	on Air Pollution - Fundamentals, Atmospheric stability, Inve	rsion, V	Wind	profi	es
		ns- Transport & Dispersion of Air Pollutants – Modeling Tech	iniques	- Ai	r	
Pollution Clima						
Unit III		rol Of Particulate Contaminants			11 He	
Factors affecting	g Select	tion of Control Equipment - Gas Particle Interaction, - Worki	ng prii	nciple	e, Des	ign
		ons of Gravity Separators (cyclone), Centrifugal separators I				
		Electrostatic Precipitators – Operational Considerations - Proc		ntrol	and	
		f APC equipment - Case studies for stationary and mobile so	urces.			
Unit IV		rol of Gaseous Contaminants			11 He	
		tion of Control Equipment - Working principle, Design and p				
		on, condensation, Incineration, Bio scrubbers, Bio filters - Pr				
		al Considerations - Costing of APC Equipment - Case studies	s for st	ation	ary an	d
mobile sources.						
Unit V		or Air Quality Management			11 He	
		rol of indoor air pollutants, sick building syndrome types - Ra				1 its
		ocess - UV photolysis – Internal Combustion Engines - Sourc	es and	Effe	cts of	
Noise Pollution	– Meas	urement – Standards –Control and Preventive measures.				
			tal:		45 H	ours
Course Outcon	nes:					
		completion of the course, Student will be able to				
		pply sampling techniques				
		pply modelling techniques				
	3. Si	uggest suitable air pollution prevention equipment's and te	chniqu	les fo	or var	ious



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

2102EV202		INDUSTRIAL WASTE MANAGEMENT	L	Τ	Р	C
			3	0	0	3
<b>Course Objec</b>						
	-	part knowledge on the concept and application of Industrial pol		-	entio	n,
	cleane	r technologies, industrial wastewater treatment and residue man	nagem	nent.		
Unit I		luction			8 He	
		ndia– Industrial activity and Environment - Uses of Water by ir			ource	s
and types of in	dustrial	wastewater – Nature and Origin of Pollutants - Industrial waste	water	and		
environmental	impacts	- Regulatory requirements for treatment of industrial wasteway	ter – I	ndust	trial	
waste survey –	- Industri	al wastewater monitoring and sampling -generation rates, chara	acteriz	zatior	<mark>ı and</mark>	
variables – Tox	<mark>ticity of</mark> i	ndustrial effluents and Bioassay tests – Major issues on water of	quality	<mark>y</mark>		
management.						
Unit II	Induct	trial Pollution Prevention & Waste Minimisation			8 He	
		of Industrial Pollution – Benefits and Barriers – Waste manage	amant	Llion		
		iques – Periodic Waste Minimisation Assessments – Evaluation				-
		Sost benefit analysis – Pay-back period – Implementing & Pron				
Prevention Op Prevention Pro			loung	1 011	ution	
Unit III	U U	trial Wastewater Treatment			10 He	our
		ation – Solids Separation – Removal of Fats, Oil & Grease- Ne	utrali			<u>, ar</u>
	-	Constituents – Precipitation, Heavy metal removal, Nitrogen &				
	U	, Adsorption, Membrane Filtration, Eletrodialysis& Evaporatio		1		
	-	Biological treatment Processes, Chemical Oxidation Processes				
		Treatability Studies.	, лuv	ance	u	
Unit IV		water Reuse and Residual Management			9 Ho	
		n Effluent Treatment Plants – Joint treatment of industrial and	domo	atio	9 П	Jury
						I
		ent discharge systems - Quality requirements for Wastewater r				
		nd issues - Disposal on water and land – Residuals of industrial				
		ion and characteristics of Sludge – Thickening, digestion, cond	litioni	ng, a	ewate	ring
-		- Management of RO rejects.			40.77	
Unit V		Studies			<u>10 H</u>	
		ng process description, wastewater characteristics, source reduc		-		
		neet for Textiles – Tanneries – Pulp and paper – metal finishing	g – Oil	l Refi	ning	-
Pharmaceutica	lls – Suga	ar and Distilleries				
		Tot	al:		45 H	ours
Course Outco	mes:					
		completion of the course, Student will be able to				
		efine the Principles of pollution prevention and mechanism of o	xidati	on pi	rocess	ses.
		ggest the suitable technologies for the treatment of wastewater		1.		
		scuss about the wastewater characteristics	-			
	4. De	esign the treatment systems				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

2103EV007	SOLID AND HAZARDOUS WASTE MANAGEMENT	L	Т	P	С
		3	0	0	3
<b>Course Objec</b>	tives:				
	To impart knowledge and skills in the collection, storage, transport, and recycling options for solid wastes including the related engineer criteria, methods and equipment.			-	
Unit I	Sources, Classification and Regulatory Framework			9 He	ours
Types and Sou	rces of solid and hazardous wastes - Need for solid and hazardous v	waste 1	nanag	gemer	nt
wastes, biomed Elements of it	s of Indian legislations on management and handling of municipal so dical wastes, nuclear wastes - lead acid batteries, electronic wastes, ntegrated waste management and roles of stakeholders - Financin or waste management.	plastic	s and	fly a	sh –
Unit II	Waste Characterization and Source Reduction			3 Hoi	irs
wastes – Haza	on rates and variation - Composition, physical, chemical and biologic rdous Characteristics – TCLP tests – waste sampling and character astes –Waste exchange - Extended producer responsibility - Recycling	ization	plan		
Unit III	Storage, Collection and Transport Of Wastes			Э Ног	irs
Analysis of C	segregation of wastes at source – storage and collection of mun ollection systems - Need for transfer and transport – Transfer static npatibility, storage, labeling and handling of hazardous wastes – hazar	ons Op	timiz	ing w	aste
Unit IV	Waste Processing Technologies			10 Ha	ours
Objectives of	waste processing - material separation and processing technolog	ies –	biolo	gical	and
chemical conv	version technologies - methods and controls of Composting -	therm	nal c	onver	sion
technologies a	nd energy recovery - incineration - solidification and stabilization of	of haza	rdous	was	tes -
	omedical wastes - Health considerations in the context of operation d impact of outputs on the environment.	of faci	lities,	hand	ling
Unit V	Waste Disposal			) Hor	irs
Waste disposation of the sign and optimized with the sign and optimized with the sign and optimized with the sign and the sign are sign as the sign are sign are sign as the sign are sign as the sign are sign are sign as the sign are sign a	options – Disposal in landfills - Landfill Classification, types and me peration of sanitary landfills, secure landfills and landfill bioreactors - ent – landfill closure and environmental monitoring – Rehabilitation	- leach	– site ate ar	selec d lan	tion dfill
	Te	otal:		45 H	ours
Course Outco				- 11	
	After completion of the course, Student will be able to				
	1. Understand the characteristics of different types of solid and l the factors affecting variation	nazardo	ous w	astes	and
	2. Define and explain important concepts in the field of solid was suggest suitable technical solutions for treatment of municipal a				
	3. Understand the role legislation and policy drivers play in stak				



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2103EV010		ENVIRONMENTAL IMPACT ASSESSMENT	L	T	Р	C
			3	0	0	3
Course Objective						
		To expose the students to the need, methodology, documenta				
		of environmental impact assessment and to develop the	e ski	ill to	pre	pare
		environmental management plan.				
	2.	To provide knowledge related to the broad field of environmer	ntal ri	sk as	sessm	nent
		important processes that control contaminant transport and to	ols th	at car	n be v	used
		in predicting and managing human health risks.				
Unit I	Intr	roduction			8 H	ours
Historical develop	pment	of Environmental Impact Assessment (EIA). EIA in Project Cy	ycle.	Legal	. and	
Regulatory aspect	ts in Ir	ndia. – Types and limitations of EIA –.EIA process- screening -	- scop	<mark>oing -</mark>	setti	ng –
<mark>analysis – mitigat</mark>	t <mark>ion. C</mark>	Cross sectoral issues and terms of reference in EIA – Public Part	ticipa	tion i	n EIA	<mark>۱.</mark>
TT •4 TT	T				10.11	
Unit II		pact Identification and Prediction Charlinta Cast han sit analysis Analysis of alternatives S	- ftrav		10 He	
		Checklists –Cost benefit analysis – Analysis of alternatives – S ns in EIA. Prediction tools for EIA – Mathematical modeling for				
		ts – air – water – soil – noise – biological — Cumulative Impac				tion
Unit III		ial Impact Assessment and EIA Documentation	1 733		8 H	01116
		ent - Relationship between social impacts and change in commu	nity	nd	0 110	Juis
		nts. Individual and family level impacts. Communities in transit			nenta	tion
•	plann	ning – organization of information and visual display materials -	– Rep	ort		
preparation.						
Unit IV		vironmental Management Plan			7 He	ours
		ment Plan - preparation, implementation and review – Mitigation			• ,	1.
		Policy and guidelines for planning and monitoring programmes	- Pos	st pro	ject a	ludii
		spects of Environmental Impact Assessment- Case Studies.			10 II.	
Unit V		vironmental Risk Assessment and Management	tia		<u>12 Ho</u>	
		essment framework-Hazard identification -Dose Response Eval e Factors, Tools for Environmental Risk Assessment– HAZOP a				ne
		nd fault tree analysis – Multimedia and multipathway exposure				
		racterization Risk communication - Emergency Preparedness Pl				ricl
management prog				-Desig	gii Ui	1150
management prog	51 anns.	Tota	al·		45 H	our
Course Outcome	es:	100			<u>10 11</u>	Juis
		er completion of the course, Student will be able to				
		Understand the necessity to study the impacts and risks that	t will	be c	auseo	d bv
		projects or industries and the methods to overcome these impact				
		Know about the legal requirements of Environmental and R		155000	sment	t fo
		projects.	ISK F	100000	,	, 101
		projecto.				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

2102EV203		UNIT OPERATIONS AND PROCESSES LABORATORY	L	Т	P	C
			0	0	2	1
Course Object						
		o develop the skill for conducting Treatability studies of wa				
		eatment by various Unit Operations and Processes using labora				
		o develop the skill for conducting Treatability studies of wa				
		reatment by various Unit Operations and Processes using laboration	tory s	scale	mode	ls.
List of Experi						
1. Coagulatio						
2. Batch stud						
		n- Characteristics of Filter media				
4. Water soft 5. Adsorption	0	Winstig				
		Silt Density Index				
		ded growth process (activated sludge process)- Sludge volume	Indox			
		systems / kinetics (Demonstration)	nuex			
		on Processes – (Ozonation, Photocatalysis)				
10. Disinfection						
		liking water	Tot	al	45 He	ours
				:		/
<b>Course Outco</b>	mes:		1			
	After	completion of the course, Student will be able to				
	1. C	conduct treatability studies for water and waste water treatment.				
	2. D	Design laboratory models for various unit operations and proces	ses.			
<b>References:</b>						
1. Metcalf an	d Eddy	. Inc. "Wastewater Engineering, Treatment, Disposal and Re	euse,	Thir	d Edi	tion,
Tata McGr	aw Hill	Publishing Company Limited, New Delhi, 2003.				
2. Lee, C.C.	and Shu	n dar Lin. Handbook of Environmental Engineering Calculati	ons, ]	Mc (	Graw ]	Hill,
New York.						
		Treatment Processes in Water and Wastewater Engineering,	John	Wil	evs S	ons.
London, 19					<u>j</u> = ~	,
		s, "Water Treatment Unit Processes: Physical and Chemical	· CP	C Pr	ess F	Roca
Raton, 200		s, ,, ,, and frequencies of the rocesses. Thy seed and Chemical	, CR		<b>C</b> 35, 1	,00a
Katon, 200	0.					



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2103EV020		ENVIRONMENTAL POLICIES AND LEGISLATION	L	Τ	Р	С
			3	0	0	3
Course Object						
		part knowledge on the policies, legislations, institutional fram	ne wor	k and		
<b>*</b> T •/ <b>*</b>		cement mechanisms for environmental management in India.			0.11	
Unit I		duction	1 1.		9 H	ours
		and Environmental Protection – National Environmenta			-	
	-	e and Polluter Pays Principle – Concept of absolute liability – ents and Protocols – Montreal Protocol, Kyoto agreement, Ri				
	-	on Act, Water (P&CP) Act, Air (P&CP) Act – Institutional	o decia	ratio	1-	
framework(SP						
Unit II		r (P&CP) Act, 1974			8 H	
		egulatory agencies - responsibilities of Occupier Provision re	•	-		
		Consent to establish, Consent to operate - Conditions of the c				-
		ures, State Water Laboratory – Appellate Authority – Penaltic			on of	
consent conditi	ions etc.	Provisions for closure/directions in apprehended pollution si	tuation	•		
Unit III	Air (	P&CP) Act, 1981			8 H	ours
Power & funct	ions of r	egulatory agencies - responsibilities of Occupier Provision re	lating t	o pre	ventio	n
and control Sch	neme of	Consent to establish, Consent to operate - Conditions of the c	consent	s - O	utlet -	-
Legal sampling	g proced	ures, State Air Laboratory – Appellate Authority – Penalties	for vio	latio	1 of	
consent conditi	ions etc.	Provisions for closure/directions in apprehended pollution si	tuation			
Unit IV	Envi	ronment (Protection) Act 1986			13 H	ours
		legation of powers – Role of Central Government - EIA Noti	ficatior			
		one Regulation - Responsibilities of local bodies mitigation				
Municipal Soli	d Waste	Management - Responsibilities of Pollution Control Boards	under I	Iazar	dous	
		occupier, authorization - Biomedical waste rules - responsib	ilities o	of ger	ierato	rs
and role of Pol	lution C	ontrol Boards				
Unit V	Othe	r Topics			7 H	nire
		Indian Forest Act, Public Liability Insurance Act, CrPC, IPC	-Public	c Inte		, ul 3
		ons - Supreme Court Judgments in Landmark cases.		-		
0	1					
			otal:		45 H	ours
Course Outer						
Course Outco		completion of the course. Student will be able to				
Course Outco	After	completion of the course, Student will be able to				
Course Outco	After 1. K	completion of the course, Student will be able to now the National environmental legislations and the policies lan programmes to comply with the legal requirements relate	d to or	Taniz	ation	



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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#### **BE CIVIL ENGINEERING**

1902CE401	BUILDING MATERIALS AND MANAGEMENT	L	Т	Р	C
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UNIT I	BUILDING MATERIALS			9 Ho	urs
Lime, Brick, T	imber and its Products, Floor and Wall Tiles, Pozzolanas, Ferrous metal	s, Ther	mal I	nsula	tion
	ing Materials: Glass, Timber, Aluminum, Plastics, Paints, Varnishes, Dist				
-	fing Materials, Ferrocement and its application, Fabre textiles - Geo memb	ranes a	nd Ge	otext	iles
for earth reinfor			1		
	BUILDING COMPONENTS			9 Ho	urs
	nd Cavity wall, Composite Masonry, Doors, Windows, Ventilators, Stairs,	Lift, Ra	mps,		
	Termite Treatment, Brick masonry- Bond- Jointing-Stone masonry			•	
	ding structures - Site Clearance - Marking –Earthwork, Slip and moving fo anitation, Fire Protection, Introduction to Building Maintenance, Acoustics			ing,	
Insulation.	annation, File Flotection, introduction to Bunding Maintenance, Acoustics	and So	una		
UNIT III SUB STRUCTURE AND SUPERSTRUCTURE TECHNIQUES					
	box jacking- pipe jacking- under water construction of diaphragm walls and	basem	ent	9 Ho	
	niques, caisson -sinking cofferdam, Dewatering and stand by plant equipme			round	ł
	, Launching girders, bridge decks, off shore platforms, braced domes and			,	
ÚNIT IV	CONSTRUCTION EQUIPMENTS	-		9 Ho	urs
	ipment for earth work - types of earthwork equipment, Equipment for mate				
	ctures, Equipment for dredging, trenching, tunneling, Equipment for compa	ction <mark>, b</mark>	atchi	ng ano	ł
	creting, Equipment for foundation and pile driving.				
	MANAGEMENT			9 Ho	urs
Materials Mana Materials Mana	gement - Material Procurement and Delivery - Inventory Control - Tradeof	ts of Co	osts in	L	
	Tota	ŀ	Δ	5 Ho	urs
COURSE OUTCO				0 110	uis
	INLS.				
6. Summar	ze the most common and advanced materials used for construction.				
7. Illustrate	the construction process of various building components.				
	he various construction methods and techniques involved in sub structure a	nd sup	er stru	cture	
1	he appropriate modern construction tools and equipment in various constru	-			
	he appropriate method of management for materials.				
REFERENCE	S:				
1. Varghese.P.C	C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.				
	"Engineering Materials", S. Chand and Company Ltd., 2008.				
3.Gambhir.M.L.	, "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 20	04			
4. Duggal.S.K.	, "Building Materials", 4th Edition, New Age International, 2008.				
	'Alternative Building Materials Technology", New Age International, 2	007.			
-	, &NehaJamwal., "Building Materials, products, properties and systems				
	ill Educations Pvt. Ltd, New Delhi, 2012.				



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	8.			ty to evalua					ter tre	atmen	t evete	m
	9.			nts to analy								
				e importance						lung	5.	
				ty to design					ystem.			
				nification o				,				
Unit I			e	EMS – SO	*	,	·	T			9 H	our
Objectives – Pe										electic		
quality parame												
and testing of p						u c s - c c	niveyance	– Hyurau	incs –	Layin	g, jon	mne
Unit II				OF WATE		TMENT					9 H	oure
Objectives – S							of floccul	ation so	dimont	ation		
disinfection – 1 Demineralization management.	on – Aera	ation – I	fron remo								– Res	sidue
Unit III	DISTRI			an anta C		т						ours
Requirements A relyrig of dig												
Analysis of dis and maintenand										ances	-opera	ation
Unit IV					vice com	ection - S						
				COLLEC		ID TD AN	ICMICCIO	N			0.11	
	atarratan			COLLEC'							<b>9 H</b>	
		Quantit	y of sanit	ary sewage	e – Storm	runoff es	stimation –	Wastewa			ristics	and
significance $-$	Effluent o	Quantit disposal	y of sanit stand ove	ary sewage er – Desigr	e – Storm n of sewe	runoff es	stimation –	Wastewa			ristics	and
significance – testing of sewe	Effluent o rs – Sewer	Quantit disposal r appurte	y of sanit stand ove nances –	ary sewage er – Desigr Pump selec	e – Storm n of sewe tion.	runoff es	stimation –	Wastewa			ristics inting	anc
significance – testing of sewe Unit V	Effluent o rs – Sewer	Quantit disposal appurter GE TRE	y of sanit stand ove nances – ATMEN	ary sewage er – Desigr Pump selec <b>T AND DI</b> S	e – Storm 1 of sewe tion. SPOSAL	runoff es rs – Con	stimation – nputer appl	Wastewa ications -	– Layiı	ng, jo	ristics inting <b>9 H</b>	and and ours
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significance – testing of sewe Unit V Objectives – So chamber, grit c Trickling filter – Sewage farm Disposal on la reclamation tec Course Outco References: Garg, S.K., Em Punmia, B.C., Newsletter, 200	Effluent of rs – Sewer election of chamber, p –Stabiliza ing. and – Dis chniques. <b>mes:</b> After co 6. 7. 8. 9. 10. vironmenta Jain, A.K., 05	Quantity disposal r appurter <b>SE TRE</b> f unit oper rimary set ition pon sposal in posal in Design Extend Build a Design quantity al Engine , and Jair	y of sanit stand over nances – ATMEN eration an edimentat ds – Sept to water to water nof the comp the water the water the water the treat the treat the treat the treat the treat	ary sewage r – Design Pump selec <b>F AND DIS</b> d process – ion tanks, a ic tanks wit bodies – u urse, Stude onents of th treatment u distribution system by nent units 1. II, Khann ronmental	e – Storm n of sewe tion. <b>SPOSAL</b> Design p activated s h soak pit Oxygen s nt will be e transmi mits basec n to the im- flow estim for the t a Publish Engineeri	runoff es rs – Con rinciples sludge pro ts – Sludg ag curve able to ssion mai l on its pr dividual b nation and reatment ers, New ng, Vol.II	stimation – nputer appl of primary ocess – Aer e: treatmer – Streeter n for the wa inciples an- uildings designing of waste waste Delhi, 2000 , Lakshmi	Wastewa ications and secon ration tan at and disp r Phelp's To ater convo d function suitable vater bas 3. Publication	- Layin ndary th k and c posal - mode otal: size of ed on	ng, jo reatmo xidati Bioga 1 – V	ristics inting 9 H ent, sc ion dit s reco Vastev 45 H	and and ourse preer tch - vvery vates
significance – testing of sewe Unit V Objectives – So chamber, grit c Trickling filter – Sewage farm Disposal on la reclamation tec Course Outcos References: Garg, S.K., Em Punmia, B.C., Mewsletter, 200 Manual on Sew	Effluent of the second	Quantity disposal r appurter <b>F TRE</b> f unit oper rimary set tion pon posal in posal in Design Design Quantity al Engine , and Jair	y of sanit stand over nances – ATMEN eration an edimentat ds – Sept to water to water nof the comp the water the water the water the treat the treat the treat the treat the treat the treat	ary sewage r – Design Pump selec <b>F AND DIS</b> d process – ion tanks, a ic tanks wit bodies – u urse, Stude onents of th treatment u distribution system by nent units 1. II, Khann ronmental	e – Storm n of sewe tion. <b>SPOSAL</b> Design p activated s h soak pit Oxygen s nt will be e transmi mits basec n to the im- flow estim for the t a Publish Engineeri	runoff es rs – Con rinciples sludge pro ts – Sludg ag curve able to ssion mai l on its pr dividual b nation and reatment ers, New ng, Vol.II	stimation – nputer appl of primary ocess – Aer e: treatmer – Streeter n for the wa inciples an- uildings designing of waste waste Delhi, 2000 , Lakshmi	Wastewa ications and secon ration tan at and disp r Phelp's To ater convo d function suitable vater bas 3. Publication	- Layin ndary th k and c posal - mode otal: size of ed on	ng, jo reatmo xidati Bioga 1 – V	ristics inting 9 H ent, sc ion dit s reco Vastev 45 H	and and ours preen tch - overy vate
significance – testing of sewe Unit V Objectives – So chamber, grit c Trickling filter – Sewage farm Disposal on la reclamation tec Course Outco Garg, S.K., Em Punmia, B.C., J Newsletter, 200 Manual on Sew	Effluent of rs – Sewer election of chamber, p –Stabiliza ing. and – Dis chniques. <b>mes:</b> After co 6. 7. 8. 9. 10. vironmenta Jain, A.K., 05 verage and f India, Ne	Quantity disposal r appurter <b>F TRE</b> f unit oper rimary set tion pon sposal in posal in Design Design Quantity al Engine , and Jair	y of sanit stand over nances – ATMEN eration an edimentat ds – Sept to water to water nof the comp the water the water the water the treat the treat the treat the treat the treat Treatmen 1997.	ary sewage r – Design Pump selec <b>F AND DIS</b> d process – ion tanks, a ic tanks wit bodies – 0 urse, Stude onents of th treatment u distribution system by nent units 1. II, Khanr ronmental 1 nt, CPHEE0	e – Storm n of sewe tion. <b>SPOSAL</b> Design p activated s h soak pit Oxygen s nt will be e transmi mits basec n to the im- flow estin for the t a Publish Engineeri D, Ministr	runoff es rrs – Con rinciples sludge pro ts – Sludg ag curve able to ssion mai l on its pr dividual b nation and reatment ers, New ng, Vol.II	stimation – nputer appl of primary ocess – Aer e: treatmer – Streeter n for the wa inciples an uildings I designing of waste w Delhi, 2000 , Lakshmi	Wastewa ications and secon ration tan at and disp r Phelp's To ater convo d function suitable :- vater bas 3. Publication ment,	- Layin hdary th k and co posal mode tal: eyance is size of ed on ons,	ng, jo reatmo xidati Bioga 1 – V	ristics inting 9 H ent, sc ion dit s reco Vastev 45 H	and and ours preen tch - overy vate
significance – testing of sewe Unit V Objectives – So chamber, grit c Trickling filter – Sewage farm Disposal on la reclamation tec Course Outco References: Garg, S.K., Em Punmia, B.C., , Newsletter, 200 Manual on Sew	Effluent of rs – Sewer election of chamber, p –Stabiliza ing. and – Dis chniques. mes: After co 6. 7. 8. 9. 10. vironmenta Jain, A.K., 05 verage and f India, Ne f India, "M	Quantity disposal r appurter <b>F TRE</b> f unit oper rimary set tion pon posal in posal in posal in Design Design Quantity al Engine , and Jair Sewage w Delhi, anual on	y of sanit stand over nances – ATMEN eration an edimentat ds – Sept to water to water nof the comp the water the water the water the treat the treat the treat the treat the treat Treatmen 1997.	ary sewage r – Design Pump selec <b>F AND DIS</b> d process – ion tanks, a ic tanks wit bodies – 0 urse, Stude onents of th treatment u distribution system by nent units 1. II, Khanr ronmental 1 nt, CPHEE0	e – Storm n of sewe tion. <b>SPOSAL</b> Design p activated s h soak pit Oxygen s nt will be e transmi mits basec n to the im- flow estin for the t a Publish Engineeri D, Ministr	runoff es rrs – Con rinciples sludge pro ts – Sludg ag curve able to ssion mai l on its pr dividual b nation and reatment ers, New ng, Vol.II	stimation – nputer appl of primary ocess – Aer e: treatmer – Streeter n for the wa inciples an uildings I designing of waste w Delhi, 2000 , Lakshmi	Wastewa ications and secon ration tan at and disp r Phelp's To ater convo d function suitable :- vater bas 3. Publication ment,	- Layin hdary th k and co posal mode tal: eyance is size of ed on ons,	ng, jo reatmo xidati Bioga 1 – V	ristics inting 9 H ent, sc ion dit s reco Vastev 45 H	and and ours preen tch - overy vate



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE552		ENVIRONMENTAL ENGINEERING LAB	L	Т	P	C
			0	0	2	1
<b>Course Objec</b>	tives:		-	-		1
0	1. To know th	e basics, importance of water and wastewater treatment and method	ods m	leasu	remen	ıt.
		e various effects of water and waste water pollution.				
	3.Effect of H	BOD and COD				
		alcium, Potassium and Sodium				
	5.Heavy me	tal effects and finding methods				
List of experin						
	-	, Electrical conductivity and turbidity				
12. Deterr	nination of Ca	alcium, Potassium and Sodium				
13. Deterr	nination of Ph	osphate and Sulphate				
14. Deterr	nination of O	otimum Coagulant Dosage by Jar test apparatus				
15. Deterr	nination of av	ailable Chlorine in Bleaching powder and residual chlorine in wat	er			
16. Deterr	nination of A	nmonia Nitrogen				
17. Estima	tion of suspe	nded, volatile and fixed solids				
18. Deterr	nination of D	issolved Oxygen				
19. Estima	tion of B.O.I	)				
20. Estima	tion of C.O. I	)				
			Tota	ıl:	45 H	ours
<b>Course Outco</b>	mes:					
		etion of the course, Student will be able to				
	1.characteriz	ze given water and waste water sample				
<b>References:</b>						
1.Standard met	hods for the e	examination of water and wastewater, APHA, 20th Edition, Washi	ingtor	n, 199	98	
		al Engineering Vol. I & II", Khanna Publishers, New Delhi	•			
		tal Engineering Vol. I & II", Standard Book House, Delhi-6				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE603		HYDROLOGY AND WATER RESOURCES ENGINEERING	L	Т	Р	С
	, Ē		3	0	0	3
<b>Course Objec</b>	tives:					
ž	To introduc	the student to the concept of hydrological aspects of nentsand should be able to quantify, control and regulate the				
Unit I	<b>PRECIPIT</b>	ATION AND ABSTRACTIONS			9 Ho	ours
Interception-	on-Rain Gau Evaporation uppression-I	Meteorological measurements–Requirements, types ges-Spatial analysis of rainfall data using Thiessen and I Horton's equation, pan evaporation mean infiltration-Horton's equation-double ring infiltrometer, infilt	asure	vetaln ment	s a	
Unit II	<b>RUNOFF</b>				9 Ho	ours
using empiri Hydrograph-	cal-Strange" -Unit Hydrog					
Unit III		ND DROUGHT			9 Ho	ours
droughtsMet Prone Area P	eorological, Programme (I				Drou	
Unit IV	<b>RESERVO</b>				9 Ho	
	age estimatio	irs, General principles of design, site selection, spillways on, sedimentation-life of reservoirs-rule curve	s, el	evatio	on—ar	ea-
Unit V	GROUND	WATER AND MANAGEMENT			9Но	ours
		types-properties of aquifers-governing equations-steady a n rural and urbanareas	<mark>ındur</mark>	<mark>isteac</mark>	<mark>ly flo</mark>	<mark>w-</mark>
<b>Further Read</b>		Tota	ıl:		45 Ho	ours
			ıl:		45 Ho	ours
	3. How to	prepare data for GIS and RS	ıl:		45 Ho	ours
	<ol> <li>How to</li> <li>Civil er</li> </ol>		ıl:		45 Ho	ours
Course Outco	3. How to 4. Civil er	prepare data for GIS and RS ngineering application for various fields	ıl:	· · · · · · · · · · · · · · · · · · ·	45 Ho	ours
	3. How to 4. Civil er omes: After comp	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to				ours
	<ol> <li>How to</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Mes:</li> <li>After comp</li> <li>Explain integrat</li> </ol>	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological process ed behavior in catchments	ses a	ndthe		ours
	<ol> <li>How to</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Matter comp</li> <li>Explain integrat</li> <li>Make u</li> </ol>	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological process red behavior in catchments se ofhydrological models to surface water problemsincludin	ses a	ndthe		ours
	<ol> <li>How to</li> <li>Civil er</li> <li>After comp</li> <li>Explain         <ul> <li>Explain</li></ul></li></ol>	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological process ed behavior in catchments se ofhydrological models to surface water problemsincludin eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood an	ses a	ndthe	eir	ours
	<ol> <li>How to</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>After comp</li> <li>Explain</li> <li>integrat</li> <li>Character</li> <li>Outline</li> <li>manage</li> <li>Describ</li> </ol>	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological process ed behavior in catchments se ofhydrological models to surface water problemsincludin eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood an ement strategies be theimportance of spatial analysis ofrainfall and design	ses a g bas d Di	ndthe sin rough	eir	ours
	<ol> <li>How to</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Explain</li> <li>integrat</li> <li>Explain</li> <li>Explain</li></ol>	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological process ed behavior in catchments se ofhydrological models to surface water problemsincludin eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood an ement strategies be theimportance of spatial analysis ofrainfall and design	ses a g bas d Di wate	ndthe sin rough	eir	
	<ol> <li>How to</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Explain</li> <li>integrat</li> <li>Explain</li> <li>Explain</li></ol>	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological process red behavior in catchments se ofhydrological models to surface water problemsincludin eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood an ement strategies be theimportance of spatial analysis ofrainfall and design irs	ses a g bas d Di wate	ndthe sin rough	eir	
Course Outco References: Subramanya .H	<ol> <li>How to</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>Civil er</li> <li>After comp</li> <li>Explain integrat</li> <li>Explain</li> <li>Character</li> <li>Outline manage</li> <li>Describ reservo</li> <li>Illustrat</li> <li>"Engineer</li> </ol>	prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological process red behavior in catchments se ofhydrological models to surface water problemsincludin eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood an ement strategies be theimportance of spatial analysis ofrainfall and design irs	ses a g bas d Di wate	ndthe sin rough	eir	



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1901MGX01		TOTAL QUALITY MANAGEMENT	L	T	P	C
			3	0	0	3
<b>Course Objecti</b>	ves:	To facilitate the understanding of Quality Managem	ent p	orinc	ples	and
_		process.				
Unit I I	NTRODI	ICTION			9 Ha	ure
		juality – Evolution of quality – Definitions of quality	$I - \Gamma$			
		ity – Basic concepts of TQM – TQM Framework –				
		sby – Barriers to TQM – Quality statements – C				
		stomer satisfaction, Customer complaints, Customer				
of quality.						
Unit II 7	CQM PRI	NCIPLES			9 Ho	urs
		quality planning, Quality Councils – Employee				
		ent, Team and Teamwork, Quality circles Recognit				
		<ul> <li>Continuous process improvement – PDCA cycl</li> </ul>	e, 58	5, K	aizen	. —
		artnering, Supplier selection, Supplier Rating				
		OLS AND TECHNIQUES I			<u>9 Ho</u>	
The seven trad	itional to	ools of quality – New management tools – Six	sigm	a: C	once	epts,
		ns to manufacturing, service sector including IT –	Benc	ch m	arkin	- g
		ench marking process – FMEA – Stages, Types.			0.11	
		OLS AND TECHNIQUES II	tion		9 Ho	
		Capability – Concepts of Six Sigma – Quality Func loss function – TPM – Concepts, improvement nee				
measures.	ii quaiity	ioss function – 11 m – Concepts, improvement nee	us –	I CII	UIIII	ince
	DUALITY	(SYSTEMS			9Ho	nrs
		SO 9001-2008 Quality System – Elements, Docun	nenta	tion.		
		- ISO 14000 - Concepts, Requirements and I				
		acturing and service sectors.				
Implementation	m manui					
Implementation	III IIIaiiai	Tota	al:	4	5 Ho	-
Further Readin			al:	4	5 Ho	-
Further Readin	g:		al:	4	5 Ho	-
Further Readin	<b>g:</b> . Engine	Tota	al:	4	5 Ho	-
Further Readin	<b>g:</b> . Engine . Constr	Tota eering economics and cost analysis	al:	4	5 Ho	-
Further Readin 3 4 Course Outcom	g: Engine Constr es:	Tota eering economics and cost analysis ruction and planning management pletion of the course, Student will be able to				ours
Further Readin 3 4 Course Outcom	g: . Engine . Constr es: After com 6. Ur	Tota eering economics and cost analysis ruction and planning management pletion of the course, Student will be able to inderstand the concepts, dimension quality and philoso				ours
Further Readin 3 4 Course Outcom	g: . Engine . Constr es: After com 6. Ur 7. Ur	Total         cering economics and cost analysis         ruction and planning management         pletion of the course, Student will be able to         iderstand the concepts, dimension quality and philoso         iderstand the principles of TQM and its strategies.				ours
Further Readin 3 4 Course Outcom	g: . Engine . Constr es: After com 6. Ur 7. Ur 8. Ap	Tota eering economics and cost analysis ruction and planning management pletion of the course, Student will be able to iderstand the concepts, dimension quality and philoso iderstand the principles of TQM and its strategies. oply seven statistical quality and management tools.				ours
Further Readin 3 4 Course Outcom	g: . Engine . Constr tes: After com 6. Ur 7. Ur 8. Ap 9. Ur	Total         cering economics and cost analysis         ruction and planning management         pletion of the course, Student will be able to         iderstand the concepts, dimension quality and philoso         iderstand the principles of TQM and its strategies.				ours



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE604		GLOB CHAN	AL WARMI GE	ING AN	D CLIM	ATE		L	Т	Р	C
								3	0	0	3
Course Obje											
	W: 5. To 6. To	arming. analyze compre	and the Earth the global w hend the imp	varming a	nd their	effects d	ue to cl	imat	e cha	inge.	
Unit I		easures.	N OF GLOB	BAL WA	RMING	r				9 Ho	ours
Introduction sulphur pollu								<mark>ılcul</mark> a	ation	<mark>s- pp</mark>	<mark>m -</mark>
Unit II	MITIGAT CARBON		<mark>MEASURE</mark> DING	<mark>, EMI</mark>	SSION	TAR(	<mark>GETS</mark>	AN	D	9 Ho	urs
Introduction- carbon dioxic by vegetation	le from veh										
Unit III	OVERVI SCIENCE		CLIMATI	<mark>e vari</mark>	ABILIT	Y ANI	<mark>) CLI</mark>	MA1	<mark>`E</mark>	9 Ho	urs
Climate dyna system and as									/sica	l clin	nate
Unit IV	<b>BASICS</b> (	<mark>OF GLO</mark>	BAL CLIM	I <mark>ATE</mark>		0		•		9 Ho	urs
Components circulation-or	*						ive forc	ing ·	- atm	nosph	eric
Unit V	<b>PHYSIC</b> A	<mark>AL PRO</mark>	CESSES IN	THE C	LIMATI	E SYSTI	<mark>EM</mark>			Ho	9 ours
Conservation conservation ocean.											
							Tota	al:	4	5 Ha	ours
<b>Course Outc</b>											
	<ol> <li>1.Outline</li> <li>2. Explain</li> <li>3. Illustrat</li> </ol>	the princ the carb te about t	of the course, ciple involved on emission the climate va nate compon	d in the g and its m ariability	reenhous itigation paramet	se gas en methods ers.	5.				
			nate compon e physical pr					ysten	n.		



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

1903CE033	WATER POLLUTION	AND MANAGEMENT	L	Т	P	C
			3	0	0	3
<b>Course Objec</b>	ves:					
		nportance and necessity of wate	er			
	6. To educate about the water po					
	7. To impart knowledge on wate					
	8. To make awareness in monito	ring and management of water				
Unit I	WATER RESOURCES					ours
	operties of water –Water resources of t operation of the sources –Water Quality Parameter		Vater Polic	y– Wa	ter cy	/cle–
Unit II	WATER POLLUTION					ours
Sources - Clas	ification, nature and Toxicology of wat	er pollutants –Ground water po	ollution-Oc	ean Po	ollutio	n by
toxic wastes- l	iver pollution-A case study					
Unit III	EFFECTS OF WATER POLLUTIO					ours
	erpollutants on Human health- Ecolo	gicaland Economic impacts	of water p	ollutio	on–Ma	arine
oilpollution an						
Unit IV	ANALYSIS & INSTRUMENTATIO					ours
Analysis of	ollutants: Titrimetry – Gravimetry	– Spectrophotometry – C	Chromatogra	aphyaı	nd F	lame
	umentation: Principles and Application		eter – Flan	ne Pho	otome	ter –
	ion Spectrophotometer –Gas Chromato					
Unit V	MONITORING & MANAGEMENT					ours
	nonitoring-Water (Prevention and Po	llution Control) act 1974 – P	Pollution co	ontrol	devic	es –
Polluters pay p	inciple.					
	1		Total:		45 H	ours
Further Read						
	3. Water supply engineering					
	4. Waste water engineering					
<b>Course Outco</b>						
	After completion of the course, Studen					
	6. Illustrate about the sources of wate					
	7. Classify the nature of pollutants an					
	8. Outline the effects of water polluti					
	9. Select the suitable analysis technic		ter estimati	on		
	10. Select the accurate monitoring and	management methods				
<b>References:</b>						
4. Laurent H	dges – Environmental Pollution					
5. Willard, N	erritt and Dean – Instrumental Analys	is				
	nalysis of Water and Waste Water					



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1901HS002	INTELLECTUAL PROPERTY RIGHTS FOR ENGINEERS	L	T	Р	С
		3	0	0	3
PREREQUISITE:		<u>.</u>		•	
covers the tradema contemp	rse assumes no prior skill or background in design, art or er he fundamental aspects of intellectual property (IP): copyrig rks, patents, geographical indications, and industrial design porary issues impacting the IP field such as: new plant varie nent of IP rights and emerging issues in IP.	ght and s. It als	related	l rights rs	,
COURSE OBJECT					
	3. A foundation in the basic conceptsof IP				
	<ol> <li>Better understanding of therelationship between IP ar health, climatechange, traditional knowledge andemerg</li> </ol>				such as
	oduction			9 He	
	opyright, Trademarks, Geographical Indicators, Industria ement of IP Rights, Emerging Issues in IP & IP Managemer		<mark>igns, P</mark>	atents,	Unfair
Module II Copy	yrights &Trademarks			6 He	ours
The concept, Case Formats & Filing Pro	Study, Historical background, Principles, Notion of Wo	rk, Rig	ghts an	d Limi	tations,
	graphical Indicators & Industrial Designs			6 H	ours
	Study, Historical background, Principles, Notion of Wo	rk, Rig	ghts an		
Formats& Filing Pro					
Module IV Patent	ts			15 E	Iours
of the International Property Protection	ic Impact of the Patent System, The Patent Application Pr Patent System and Regional Patent Protection Mechan Based on Types of Inventions, Legal Issues of the Pater nt Cases and Discussions, IP and Development - Flexibiliti	isms, 1 nting P	Kinds rocess,	of Inte Enfor	ellectual cement
	Cooperation Treaty			9 He	ours
What is PCT? Use	of PCT, Preparing a PCT Application, PCT Services, Ernational Search, International Examination	Patent	Agent	and C	ommor
•		,	ΓΟΤΑ	L: 45 I	HOURS
<ol> <li>Explain conc</li> <li>Explain basi</li> <li>Explain conc</li> <li>Develop a sa</li> </ol>	ous types of IPRs specific to Engineering cepts such as Copyrights, Trademarks, GIs and Industrial de c concepts of Engineering Patents cept of Patent Search and various methods to do it ample PCT Application and explain examination procedures	-			
FURTHER READIN					
4.	Intellectual Property Rights by PandeyNeeraj&DharniKhu Fundamentals of IPR: for students, Industrialist and patent Anil Kumar HS, 2017Drucker			akrishn	a B &
<b>REFERENCES:</b>	R by Dr MK Bandarai, Central Law Publication, 2014				
	llectual Property Rights, H.S. Chawla, Oxfors& IBH Publishir	ng 2020	)		
	by JP Mishra, Central Law Publications	ig, 2020	J		
	gle.comIntroduction to IPR books				
<u>mups.//patents.g00</u> g	geteronina outeron to h k books				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1901HS00	6	DESIGN THINKING FOR INNOVATION	L	Т	Р	С
			3	0	0	3
DDEDEOI	HOLTE.					
PREREQU		na agging a miga drill a badranaund in dagion ant angina				Itia
		se assumes no prior skill or background in design, art, engined all undergraduates and graduate students with an interest in lea				
		y recommended for those students planning social-venture and				
	intervent		i otner	Kinds 0	i desig	
COURSE						
		erstand how teaching and learning occurs in the design process	5			
		ognize the ethical and social dilemmas and obligations of the p		of desi	gn	
	9. Diag	nose common adoption barriers in individuals, groups and org	anizati	ons.		
	10. Deve	elop a design theory from independent and qualitative research	and ol	oservati	ons	
	11. Parti	cipate in and lead innovation in creative and collaborative sett	ings			
	12. Und	ertake complex and unstructured problem-solving challenges i	n unfai	niliar d	omains	
Module I	Introd	uction to Design Thinking				ours
		sign, Why Design Thinking, 5-Step Design Thinking Pro-	cess, A	Applicat	tions, (	Creativ
	-	ure of Innovation				
Module II		I Thinking Approach				Hours
		Design Thinking, Divergent Thinking & Innovation Funnel,				Maps t
		Opportunities, Case Study : Turing Creative Ideas into Viab	le Con	npanies		
Module II		oring Design Thinking ToolKit			5 H	ours
		ntion, Ideation, Experimentation, Evolution			5 11	ours
		<mark>1 Challenge Project: Phase-1</mark> Project Plan, How Might We statement, Project Timeline, F	raiaat	Chaold		ours
		Challenge Project: Phase-2	Tojeci	CHECKI		lours
		and the Challenge, Prepare Research, Gather Inspiration, I	nternr	etation		
		, Frame Opportunities, Ideation – Generate Ideas, Refin				
		t Feedback, Evolution – Track Learnings, Engage Others	- 1000	-, <u></u> ,,,,,,,,,,		
	<b>7</b> 1 /		I	ΤΟΤΑΙ	L: 45 I	HOUR
Course Ou						
		epts and basics of Design Thinking Principles				
		n Thinking Approach through IDEO's method & Customer Jo				
		views and synthesize learnings to uncover insights and identify	oppor	tunities	for inn	ovatio
		iven Innovative Solutions to RealWorld Problems				
FURTHEF						
		for Social Impact: How to by IDEO.org				
		n Thinking ToolKit by IDEO.org eld guide to Human Centered Design by IDEO.org				
REFEREN						
	CES:		wid M	Kellev	and To	om
	CES: Confidence	e: Unleashing the Creative Potential Within Us AllBook by Da	wid M	. Kelley	and To	om
1.Creative ( Kelley, 201	CES: Confidence 3			•	and To	om



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1901MGX07		UNIVERSAL HUMAN VALUES & ETHICS	L 3	<u>T</u> 0	P 0	C 3
Course Object	tives:		5	U	U	5
	<ol> <li>To he basic gu</li> <li>To he 'really w</li> <li>To he being.</li> <li>To far and live</li> <li>To far and live</li> </ol>	Ip students distinguish between values and skills, and un idelines, content and process of value education. Ip students initiate a process of dialog within themselves rant to be' in their life and profession Ip students understand the meaning of happiness and pros cilitate the students to understand harmony at all the level accordingly. cilitate the students in applying the understanding of harm fession and lead an ethical life	to kn sperity ls of 1	ow v / for huma	what a hu an liv	they man ing,
Unit I	Course	Introduction - Need, Basic Guidelines, Content and	d		9 H	ours
C III C		for Value Education	u		/ 11	Juis
look at basic the basic req priority - Un	Human uirement nderstand	chanism for self-exploration - Continuous Happiness a Aspirations - Right understanding, Relationship and P s for fulfillment of aspirations of every human being ing Happiness and Prosperity correctly- A critical hod to fulfill the above human aspirations: understan	hysic with appr	al F their raisa	acilit r cor l of	ies- rect the
			ung	and	livin	g in
harmony at v	arious le	vels	Ũ	and		
harmony at v Unit II	arious le <sup>.</sup> Unders Myself	vels tanding Harmony in the Human Being - Harmony (	in		9 H	ours
harmony at v Unit II Understanding Understanding instrument of of 'I' and har	arious le Unders Myself g human g the need 'I' (I bein mony in '	vels	in mater ding tl ristics yam a	rial he Bo and and S	9 Ho Body ody a activ Swast	y' - s an ities
harmony at v Unit II Understanding Understanding instrument of of 'I' and har correct apprais	arious le Unders Myself g human g the need 'I' (I bein mony in ' sal of Phy Unders	vels tanding Harmony in the Human Being - Harmony being as a co-existence of the sentient 'I' and the s of Self ('I') and 'Body' - Sukh and Suvidha - Understand g the doer, seer and enjoyer) - Understanding the character I' - Understanding the harmony of I with the Body: Sany sical needs, meaning of Prosperity in detail - Programs to of tanding Harmony in the Family and Society- Harm	in mater ding th ristics yam a ensur	rial he Bo and and S e Sar	9 Ho Body ody a activ Swast	y' - s an ities hya; and
harmony at v Unit II Understanding Understanding instrument of of 'I' and har correct apprais Swasthya Unit III Understanding human-human Trust (Vishwa meaning of V of Samman, D Understanding family): Sama universal har	arious let Unders Myself g human g the need 'I' (I bein mony in ' sal of Phy Unders in Hum g harmony relations s) and Res ishwas; D ifference g the dhan, San monious	vels tanding Harmony in the Human Being - Harmony being as a co-existence of the sentient 'I' and the s of Self ('I') and 'Body' - Sukh and Suvidha - Understand g the doer, seer and enjoyer) - Understanding the character I' - Understanding the harmony of I with the Body: Sany sical needs, meaning of Prosperity in detail - Programs to o	in mater ding the ristics yam a ensure nony erstand sure ( - Und nding s in rel n en sin rel n en sin rel n en sin rel	rial he Be and S e Sar ding <i>Ubha</i> ersta the lation xtens Visu	9 Ho Body a activ Swast hyam 10 Ho value y-trip nding mean ship sion alizin	y' - s an ities shya; and ours ours ours ours ours ours ours ours
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Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order:a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers - b) At the level of society: as mutually enriching institutions and organizations

		Total:	45 Hours
Further Proceeding:			
2.	Analysis about Code of Conduct for Ethical & Moral	l values	
Course Outcomes:			
After co	npletion of the course, Student will be able to		
1. Und	erstand the significance of value inputs in a cla	ssroom and s	start applying
them in	their life and profession		
2. Dist	inguish between values and skills, happine	ess and accu	umulation of
physica	l facilities, the Self and the Body, Intention	n and Comp	etence of an
individ	ial, etc.		
3. Und	erstand the value of harmonious relationship b	ased on trust	and respect
in their	life and profession		
4. Und	erstand the role of a human being in ensuring	g harmony ir	n society and
nature.			
5. Dist	inguish between ethical and unethical practic	es, and start	working out
the stra	tegy to actualize a harmonious environment w	herever they	work.
References:			
1. A Nagraj, 1998, Jeeva	nVidyaEkParichay, Divya Path Sansthan, Amarkanta	k.	
	990, Science and Humanism, Commonwealth Publish	iers.	
3. A N Tripathy, 2003, H	uman Values, New Age International Publishers.		
4. Ivan Illich, 1974, Ener	gy & Equity, The Trinity Press, Worcester, and Harp	er Collins, USA	4



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1902CE019		L	Т	Р	С
	COASTAL ZONE MANAGEMENT	3	0	0	3
	At the end of the semester, 1.The student shall be able to understand the coastal processes				
Course Objectives:	2. The student shall be able to understand the coastal dynamics				
objectives.	3.The student shall be able to understand impacts of structures like do quays leading to simple management perspectives along the coastal zero.		arbors	and	
Unit I	COASTAL ZONE			9 H	
	Coastal zone regulations – Beach profile – Surf zone – Off shore – Coastal	water	s - E	stuari	es —
	Lagoons – Living resources – Nonliving resources.				
	AVE DYNAMICS			9 H	
	tion - Airy's Linear Wave theory - Deep water waves - Shallow water wa				
	- Wave Decay - Reflection, Refraction and Diffraction of waves - Breaki	ng of	waves	s - W	ave
	res – Vertical – Sloping and stepped barriers – Force on piles.			0.11	
	AVE FORECASTING AND TIDES sting – SMB and PNJ methods of wave forecasting – Classification of tide	- D.	,	9 H	ours
	ory of tides – Effects on structures – seiches, Surges and Tsunamis.	s - Da	irwin	s	
	OASTAL PROCESSES			9 H	aure
	positional shore features – Methods of protection – Littoral currents – Coas	+-1	:c		
LIUSION and uc					<b>.</b>
		star aq	uners	– Sea	l
water intrusion	– Impact of sewage disposal in seas.	star aq			
water intrusionUnit VH	– Impact of sewage disposal in seas. ARBOURS			9 H	ours
water intrusionUnit VHStructures near	<ul> <li>Impact of sewage disposal in seas.</li> <li>ARBOURS</li> <li>coast – Selection of site – Types and selection of break waters – Need and</li> </ul>			9 H	ours
water intrusionUnit VHStructures near	<ul> <li>Impact of sewage disposal in seas.</li> <li>ARBOURS</li> <li>coast – Selection of site – Types and selection of break waters – Need and edgers – Effect of Mangalore Forest.</li> </ul>	mode	of dr	9 Ho edgin	ours g –
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water intrusion         Unit V       H         Structures near         Selection of dre         Further Readit         1:         2:         B	Impact of sewage disposal in seas.     ARBOURS     coast – Selection of site – Types and selection of break waters – Need and     dgers – Effect of Mangalore Forest.     Tot ng:     Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scier     999     Quinn, A.D., "Design & Construction of Ports and Marine Structures", Ma ook Co., 1999	mode	of dr Publis	9 Ho edgin 45 Ho	ours g – ours
water intrusion Unit V H Structures near Selection of dre Further Readii 1 1 2 2 B Course Outcor	Impact of sewage disposal in seas.     ARBOURS     coast – Selection of site – Types and selection of break waters – Need and     dgers – Effect of Mangalore Forest.     Tot ng:     Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scier     999     Quinn, A.D., "Design & Construction of Ports and Marine Structures", Mo     ook Co., 1999 nes:	mode	of dr Publis	9 Ho edgin 45 Ho	ours g – ours
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### **ME ENVIRONMENTAL ENGINEERING**

17EV102		ENVIRONMENTAL CHEMISTRY	L	Т	P	C
			3	0	0	3
<b>Course Ob</b>	<b>V</b>					
		acate the students about water chemistry				
		part knowledge in the area of air and soil chemistry				
		part knowledge on the transformation of chemicals in th	e environ	ment		
Unit I	<mark>Introduct</mark> i				9 He	ours
Stoichiome	try and mass	s balance-Chemical equilibrium, acid base, solubility pro	oduct (Ksj	), he	avy	
metal precip	pitation, amp	photeric hydroxides, CO2 solubility in water and species	s distribut	ion –		
Chemical k	inetics, First	order- 12 Principles of green chemistry.				
Unit II	Aquatic C	hemistry			11 H	our
environmer Degradation diagrams, r	nt, volatili n of syntheti edox zones -	rs- environmental significance and determination; Fate of zation, partitioning, hydrolysis, photochemical c chemicals-Metals, complex formation, oxidation and r - sorption- Colloids, electrical properties, double layer the	l transformeduction,	rmati pE –	on – • pH	
U		, coagulation.				
		ric Chemistry chemical and photochemical reactions – photochemica	1 0		7 H	
Unit IV Nature and	Soil Chem compositior	iculates. Air quality parameters-effects and determination istry of soil-Clays- cation exchange capacity-acid base and i memicals in soil-Reclamation of contaminated land; salt b	on-excha			
		remediation.	5	C	5	
Unit V		ental Chemicals			9 H	ours
Dioxins,PC	Bs,PAHs an	l speciation –Speciation of Hg &As- Organic chemicals- d endocrine disruptors and their Toxicity- Nano materia ntal applications.			a,	
			Total:		45 H	our
<b>Further Re</b>	eading					
	To analyze	and create a solution for environmental issues.				
Course Ou	tcomes:					
	After com	bletion of the course, Student will be able to				
	6. Disting	guish the chemistry involved				
	7. Unders	stand the chemistry involved in water				
		y and solve the air pollution related issues				
		y and solve the all pollution related issues				
		stand the soil related chemistry and issues				



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Course Ol	ioatiraa		3	0	0	3
Course Ob	<b>v</b>	rse provides a basic understanding on microbiology relevant	to		~~~~~	mto 1
		ing for candidates with little prior knowledge of the subject.	10 0		onne	mai
		rphology, behavior and biochemistry of bacteria, fungi, proto	708	vir	uses	and
		e outlined.	/20u	, vii	uses,	unc
		robiology of wastewater, sewage sludge and solid waste treat	mer	t pro	cesse	es is
	also pro	ovided. Aspects on nutrient removal and the transmission on ns are also covered.				
		sure to toxicology due to industrial products and byproducts ar	e al	50 CC	verec	1.
		rse provides a basic understanding on microbiology relevant				
		ring for candidates with little prior knowledge of the subject.				
Unit I		on And Characteristics			5 Ho	ours
Classificati	on of microorg	ganisms - prokaryotic, eukaryotic, cell structure, characteristics	, Pr	eserv	ation	of
microorgar	nisms, DNA, R	NA, replication, Recombinant DNA technology.				
Unit II		nd Nutrient Cycles			10 Ho	ours
		nisms – Distribution / diversity of Microorganisms – fresh and				
		urface soil, Air – outdoor and Indoor, aerosols, biosafety in Lab			_	
		rchaebacteria - Significance in water supplies - problems and o				
		iogeochemical cyclesHydrological - Nitrogen, Carbon, Pho	ospł	orus	,	
Sulphur, C		Micro Organism in nutrient cycle.				
Unit III		of Microorganisms			10 Ho	
		in microorganisms, growth phases, carbohydrate, protein, lipid				_
-		naerobic-fermentation, glycolysis, Kreb"s cycle, hexose monop			e	
		rt system, oxidative phosphorylation, environmental factors, en	izvn	ies.		
Bioenerget	•		2,1	,		
-			291		10.11	
Unit IV	Pathogens in	n Wastewater	_		10 Ho	ours
Unit IV Introductio	Pathogens in n to Water Bor	n Wastewater rne pathogens and Parasites and their effects on Human, Anima	l an	d Pla	nt	
health, Tra	<b>Pathogens in</b> n to Water Bon nsmission of p	n Wastewater rne pathogens and Parasites and their effects on Human, Anima athogens – Bacterial, Viral, Protozoan, and Helminths, Indicato	l an or or	d Pla ganis	int sms o	f
Unit IV Introductio health, Tra water – Co	Pathogens in n to Water Bon nsmission of p liforms -	n Wastewater rne pathogens and Parasites and their effects on Human, Anima athogens – Bacterial, Viral, Protozoan, and Helminths, Indicato total coliforms, E-coli, Streptococcus, Clostridium, Concentrat	l an or or ion	d Pla ganis and o	int sms o detect	f
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10. The candidate has the ability to conduct and test the toxicity due to various natural and synthetic products in the environment.

#### **References:**

- 8. S.C.Bhatia, Hand Book of Environmental Microbiology, Part 1 and 2, Atlantic Publisher
- 9. Gabriel Bitton, Wastewater Microbiology, 2nd Edition,
- 10. Raina M. Maier, Ian L. Pepper, Charles P. Gerba, Environmental Microbiology, Academic Press.
- 11. SVS. Rana, Essentials of Ecology and Environmental Science, 3rd Edition, Prentice Hall of India Private Limited
- 12. Stanley E. Manahan, Environmental Science and Technology, Lewis Publishers.
- Hurst, C.J. (2002) Manual of Environmental Microbiology. 2nd Ed. ASM PRESS, Washington, D.C. ISBN 1-55581 - 199 - X.

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17EV104		TRANSPORT OF WATER AND WASTEWA	ATER	L	Т	P	C
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		ate the students in detailed design concepts relate		ansn	nissi	on ma	ains,
		stribution system, sewer networks and storm wate					
<b>T</b> T <b>1</b> / <b>T</b>		ate the students in computer application on design	n.			0.11	
Unit I		draulics and Flow Measurement		• 1		<u>8 He</u>	
		w – continuity principle, energy principle and mo sure flow, minor heads losses, Carrying Capacity				ctiona	l
Unit II	Water Tr	smission and Distribution				10 He	ours
networks I	Design, analy	ting, laying and maintenance, water hammer ana s and optimization – appurtenances – corrosion pr ion Storage reservoirs.					
Unit III	Wastewat	<b>Collection and Conveyance</b>				10 He	ours
	ce of sewers;	of sanitary sewer; partial flow in sewers, econor imping stations- sewer appurtenances; material, o besign of sewer outfalls-mixing conditions; conve	construction,	inspe	ectio	n and	
maintenand wastewater Unit IV Necessity-	ce of sewers; rs. Storm Wa - combined	umping stations- sewer appurtenances; material, o	construction, eyance of corr	inspe osive	ectio	7 He	
maintenand wastewaten Unit IV Necessity- intensity du	ce of sewers; rs. Storm Wa - combined uration and f	amping stations- sewer appurtenances; material, or besign of sewer outfalls-mixing conditions; conver- er Drainage d separate system; Estimation of storm water run quency relationships- Rational methods.	construction, eyance of corr	inspe osive	ectio e	<b>7 H</b> infall	ours
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maintenand wastewater Unit IV Necessity- intensity du Unit V Use of con LOOP vers Further R	ce of sewers; rs. Storm Wa - combined uration and f Case Stud nputer softwa sion 4.0, SEV ceading Designing utcomes: After com 6. Under 7. Design 8. Design	amping stations- sewer appurtenances; material, or besign of sewer outfalls-mixing conditions; conver- er Drainage d separate system; Estimation of storm water run quency relationships- Rational methods. s and Software Applications in water transmission, water distribution and seve ER, BRANCH, Canal ++ and GIS based software Fpipelines and sewers for various project areas etion of the course, Student will be able to and the fluid flow properties vater supply main, distribution network and sewe he drainage network for wastewater	construction, eyance of corr n-off Formulat wer design – l es.	inspectors in the second secon	ectio e	7 Ho infall 10 Ho 2.0, 45 Ho	DURS
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV105		PRINCIPLES AND DESIGN OF PHYSICO-	L	Т	P	C
		CHEMICAL TREATMENT SYSTEMS				
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Course Ob						
		ucate the students on the principles and process designs of	var	ious	treatr	nen
		s for water and wastewater				
		cate the students on design of treatment systems and the comp	poner	nts co	ompri	sing
		ystems, leading to the selection of specific process.				
Unit I	Introducti				5 He	
		wastewater - characteristics, Standards for performance - Sign				
	reatment –	Selection criteria-types of reactors- reactor selection-batch-	cor	ntinuo	ous t	ype <sup>.</sup>
kinetics.						
Unit II	Treatmon	t Principles			10 Ho	
		creening – Mixing, Equalization – Sedimentation – Filtratio	n			
		sfer – mass transfer coefficient Adsorption – Isotherms – Me				
	0	1			1	
		o filtration, ultra-filtration and hyper filtration electro dial				
		zation - Recent Advances. Principles of Chemical treatm				
	-	ation - flotation solidification and stabilization - Disinfecti		lon e	excha	nge
		olvent extraction – advanced oxidation /reduction – Recent Tree	ıds			
Unit III		Municipal Water Treatment Plants			10 Ha	
Selection of	f Treatment	- Design of municipal water treatment plant units - Aerators -	chen	nical	feedi	ng –
Flocculation	n – clarifier	- tube settling - filters - Rapid sand filters, slow sand filter, j	oress	ure f	ilter,	dua
media Disir	nfection - D	isplacement and gaseous type - Flow charts - Layouts - Hydra	aulic	Prof	ile, P	ID -
construction	n and O&M	aspects - case studies, Residue management - Upgradation of	of ex	isting	g plan	ts -
Recent Trei	nds.					
Unit IV	<b>Design of</b>	Industrial Water Treatment Plants			10Ho	urs
Design of I	ndustrial Wa	ater Treatment Units- Selection of process – Design of softener	rs – I	Demi	nerali	ser
		nts –Flow charts – Layouts –Hydraulic Profile, PID - const				
aspects - ca	ase studies, H	113 - 110 $10$ $110$ $10$ $10$ $10$ $10$ $10$				CC IV.
- TI:+ \7	Design of	Residue management – Upgradation of existing plants – Recent		ds.		
UNITV	Design of	Residue management – Upgradation of existing plants – Recent			10 Ha	
Unit V Design of		Residue management – Upgradation of existing plants – Recent Wastewater Treatment Plants	Tren		10 Ho s- sh	ours
Design of	municipal v	Residue management – Upgradation of existing plants – Recent Wastewater Treatment Plants wastewater treatment units-screens-detritors-grit chamber-sett	Tren ling	tank	s- slı	ours idge
Design of thickening-	municipal v sludge dewa	Residue management – Upgradation of existing plants – Recent Wastewater Treatment Plants wastewater treatment units-screens-detritors-grit chamber-sett atering systems-sludge drying beds - Design of Industrial Waster	Tren ling stewa	tank ater [	s- slı Freatr	ours idge
Design of thickening- Units-Equa	municipal v sludge dewa lization- Ne	Residue management – Upgradation of existing plants – Recent Wastewater Treatment Plants wastewater treatment units-screens-detritors-grit chamber-sett atering systems-sludge drying beds - Design of Industrial Was utralization-Chemical Feeding Devices-mixers- floatation units	Tren ling stewa	tank ater T skim	s- slu Freatr mer F	ours idge nen Tlow
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Design of thickening- Units-Equa charts – La Residue ma Further Re	municipal v sludge dewa lization- Ne youts –Hyd nagement – eading Implement tcomes: After comp 6. Identif	Residue management – Upgradation of existing plants – Recent Wastewater Treatment Plants wastewater treatment units-screens-detritors-grit chamber-sett attering systems-sludge drying beds - Design of Industrial Was utralization-Chemical Feeding Devices-mixers- floatation units raulic Profile, PID, construction and O&M aspects – case stu Upgradation of existing plants – Recent Trends. Tota ation of advanced treatment technologies for various wastewate bletion of the course, Student will be able to y the pollutants type in the wastewater	Tren ling stewa s-oil idies,	tank ater T skim Retr	s- slu Freatr mer F cofitti 45 Ho	ours idge nen low ng
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Design of thickening- Units-Equa charts – La Residue ma Further Re	municipal v sludge dewa lization- Ne youts –Hyd nagement – eading Implementa tcomes: After comp 6. Identif 7. Unders 8. Desigr 9. Desigr	Residue management – Upgradation of existing plants – Recent Wastewater Treatment Plants wastewater treatment units-screens-detritors-grit chamber-sette attering systems-sludge drying beds - Design of Industrial Wastewater utralization-Chemical Feeding Devices-mixers- floatation units raulic Profile, PID, construction and O&M aspects – case stu Upgradation of existing plants – Recent Trends. Tota ation of advanced treatment technologies for various wastewate pletion of the course, Student will be able to y the pollutants type in the wastewater stand the various treatment principles	Tren ling stews s-oil dies, r trez	tank ater T skim Retr	s- slu Freatr mer F cofitti 45 Ho	ours idge nen low ng



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV106		ENVIRONMEN	<b>FAL CHE</b>	MISTRY I	ABORA	TORY	L	Т	P	C
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Course Obj		·	1 • 1			1 (				
		n in the analysis of p								
I :		n in the analysis of	chemical pa	rameters o	i water ai	id waste w	ater			
List of Expe		ry Practices,	Quality	aantral	001	ibration	of	(	Glassy	voro
0. 0000 03	Laborato	ry Practices,	Quality	control	, cai	IDIATION	01	,	JIASS	ware
	a and Anal	lysis of water (pH,	alkalinity	hardness	chloride	Sulphate	turbi	lity ]	C T	
nitrate,	g and Ana	lysis of water (pii,	aikaiiiity,	nar difess v	cinoriae,	Sulphace,	turon	any i	fluoi	
12									muor	(iuc)
8. Wastewa	ater analysi	s (BOD, COD, Pho	osphate, Tk	N. Oil &	Grease,	Surfactant	and	heavy	/ met	als).
12	, j		1 /		,					
9. Samplin	g and ana	alysis of air poll	utants An	bient &	Stack (	RSPM,	SO2	and	NO	x)
<mark>09</mark>										
10. Samplin	g and	characterization	of so	il (CEC	C &	SAR,	pН	aı	nd	<u>K).</u>
<mark>09</mark>							1			
							Tot	tal	45 He	ours
		1						:		
Course Out										
		letion of the course,		ll be able t	0					
		quality of environme								
		et analysis on charac	teristics of	water and v	waste wat	ter				
References:										
6. APHA, 5	Standard Me	ethods for the Exam	ination of V	Vater and V	Vastewat	er, 21st Ed	•			
7. Washing	gton, 2005.									
8. Laborate	ory Manual	for the Examination	of water, v	vastewater	soil Rum	p, H.H. and	d Kris	t, H.		
9. Second	Edition, VC	H, Germany, 1992.								
10. Methods	s of air	sampling & and	alysis, Jar	nes P.Loo	lge Jr(E	Editor) 3r	d E	ditior	n, Lo	ewis
publishe	rs,Inc,USA,	,1989.	-							
								-	-	
17EV107		ENVIRONMENT	AL MICR	OBIOLOO	GΥ		L	T	Р	C
		LABORATORY								
							0	0	2	1
Course Obj										
	1. To train	n in the analysis of p	physical par	ameters of	water and	d waste wa	ter			
	2. To train	n in the analysis of c	chemical pa	rameters of	water an	d waste wa	ater			
List of Expe	eriments:									
1. Preparat	ion of cultu	<mark>re media</mark>								
2. Isolation	n, culturing a	and Identification of	f Microorga	nisms						
3. Microor	ganisms fro	m polluted habitats	(soil, water	and air)						
4. Measure	ement of gro	wth of microorganis	sms, Assay	of enzyme	s involve	d in biotrai	nsforn	natio	1	
5. Biodegra	adation of o	rganic matter in was	ste water A	nalysis of a	ir borne 1	nicroorgan	isms			
6. Staining	of bacteria	~								
7. Effect of	f pH, tempe	rature on microbial	growth							
	<u> </u>	sing microbes from	<u> </u>	ffluent.						
		on soil microorganis								
	-	ysis of wastewater (		E.coli. Stre	ptococcu	s) – MPN				
	<u> </u>	ysis of wastewater (			*		es			
	<u> </u>	tals on microbial gro		p:0000			~			



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

13. Detection of Anaerobic bacteria (Clostridium sp.)		
14. Bioreactors		
	Total	45 Hours
	:	
Course Outcomes:		
After completion of the course, Student will be able to		
1. Field oriented testing of water, wastewater and solid waste for microb	oial conta	mination.
2. Perform toxicity test.		
References:		
1. Standard methods for the examination of water and wastewater, American Public	Health A	Association
(21st edition) 2005.		
2. Charles Gerba, Environmental Microbiology: A laboratory man	ual, Else	vier
Publications, 2012.		
3. Christon J. Hurst, Ronald L. Crawford, Jay L. Garland, David A. Lipson, Aaron	L. Mills,	and Linda
D. Stetzenbach, Manual of Environmental Microbiology, 3rd Edition, ASM Press,	2007.	



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV201		PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEMS	L	T	P	С
	-		3	0	0	3
Course Ol	jectives:				, v	-
		the students on the principles and process designs of various	s treatm	ent s	ystem	S
	for water a	nd wastewater and students should gain competency in the pr	rocess e	emplo	oyed i	n
	design of t	reatment systems and the components comprising such system	ns, lead	ding t	o the	
	selection o	f specific process.				
Unit I	Introducti				10 H	
Objectives	of biological	l treatment – significance – Principles of aerobic and anaerob	ic treat	ment	- kin	etic
-		Factors affecting growth – attached and suspended growth - D				
Kinetic coe	efficients for	organics removal - Biodegradability assessment -selection or	f proce	ss- re	actors	<u>;-</u>
batch-conti	inuous type.					
Unit II	Acrobia	reatment of Wastewater			10 H	
		nent plant units – Activated Sludge process and variations, Se	allenci			Jui
		blogical Reactors-Trickling Filters-Bio Tower-RBC-Moving				
		aerated lagoons, waste stabilization ponds – nutrient removal				
		structed wet land – Disinfection – disposal options – reclamat				ow
		raulic profile, recent trends.				
Unit III		Treatment of Wastewater			10 H	our
Attached a	nd suspended	d growth, Design of units – UASB, up flow filters, Fluidized	beds M	BR, s	septic	
tank and di	sposal – Nut	rient removal systems - Flow chart, Layout and Hydraulic pr	ofile –	Rece	nt tre	nds
Unit IV		eatment and Disposal			5 H	
		gement facilities, sludge thickening, sludge digestion, biogas				e
		l and gravity) Layout, PID, hydraulics profile – upgrading ex	isting p	lants	-	
		al – recent advances.				
Unit V		on Onevetiens and Maintenance Aspects			<u>10 H</u>	our
a		ion Operations and Maintenance Aspects	0			
		tional Maintenance problems – Trouble shooting – Planning,				
controlling	of plant ope	tional Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa				s –
controlling		ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities.	ge treat	tment	plant	
controlling sludge mar	of plant open agement fac	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities.		tment		
controlling sludge mar	of plant openagement fac	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities.	ge treat	tment	plant	
controlling sludge mar	of plant ope hagement fac itcomes: After comp	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. Te pletion of the course, Student will be able to	ge treat	tment	plant	
controlling sludge mar	of plant ope         nagement fac         itcomes:         After comp         3. Development	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. Te pletion of the course, Student will be able to p conceptual schematics required for biological treatment of	ge treat	tment	plant	
controlling sludge mar Course Ou	of plant open agement fac itcomes: After comp 3. Develo 4. Transla	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. Te pletion of the course, Student will be able to	ge treat	tment	plant	
controlling sludge mar Course Ou Reference	of plant open agement fac itcomes: After comp 3. Develo 4. Transla s:	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. pletion of the course, Student will be able to pp conceptual schematics required for biological treatment of ate pertinent criteria into system requirements.	ge treat	vater	plant 45 H	our
controlling sludge mar Course Ou Reference 5. Arceiv	of plant open agement fac itcomes: After comp 3. Develo 4. Transla s:	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. Te pletion of the course, Student will be able to p conceptual schematics required for biological treatment of	ge treat	vater	plant 45 H	our
controlling sludge mar Course Ou Reference 5. Arceiv 2000.	of plant ope         hagement fac         itcomes:         After comp         3. Develo         4. Transla         s:         ala, S.J., Wa	Ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. Te pletion of the course, Student will be able to op conceptual schematics required for biological treatment of ate pertinent criteria into system requirements. astewater Treatment for Pollution Control, TMH, New Do	ge treat <b>otal:</b> wastev elhi, So	vater	plant 45 Ho I Edi	bur
controlling sludge mar Course Ou Reference 5. Arceiv 2000. 6. Manua	of plant ope         hagement fac         itcomes:         After comp         3. Develo         4. Transla         s:         ala, S.J., Wa         l on "Sewee	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. pletion of the course, Student will be able to pp conceptual schematics required for biological treatment of ate pertinent criteria into system requirements.	ge treat <b>otal:</b> wastev elhi, So	vater	plant 45 Ho I Edi	bur
controlling sludge mar Course Ou Reference 5. Arceiv 2000. 6. Manua Govern	of plant openagement fac         itcomes:         After comp         3. Develor         4. Transla         s:         ala, S.J., Wa         l on "Sewed         imment of Indi	ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. Templetion of the course, Student will be able to poper conceptual schematics required for biological treatment of ate pertinent criteria into system requirements. astewater Treatment for Pollution Control, TMH, New De erage and Sewage Treatment" CPHEEO, Ministry of ia, New Delhi, 1999.	ge treat otal: wastev elhi, So Urban	vater econd	plant 45 Ho I Edi elopn	ior
controlling sludge mar Course Ou Reference 5. Arceiv 2000. 6. Manua Govern 7. Metcal Graw-J	of plant openagement fac         itcomes:         After comp         3. Develor         4. Translast         s:         ala, S.J., Wather of Indiant         f & Eddy, It         Hill Publishin	Ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. pletion of the course, Student will be able to op conceptual schematics required for biological treatment of ate pertinent criteria into system requirements. astewater Treatment for Pollution Control, TMH, New Do erage and Sewage Treatment" CPHEEO, Ministry of ia, New Delhi, 1999. NC, "Wastewater Engineering – Treatment and Reuse, Fou ng Company Limited, New Delhi, 2003.	ge treat otal:	vater econd Devo ition,	plant 45 Ho I Edi elopm Tata	ior M
controlling sludge mar Course Ou Course Ou Reference 5. Arceiv 2000. 6. Manua Govern 7. Metcal Graw-J	of plant openagement fac         itcomes:         After comp         3. Develor         4. Translast         s:         ala, S.J., Wather of Indiant         f & Eddy, It         Hill Publishin	Ational Maintenance problems – Trouble shooting – Planning, rations – capacity building - Retrofitting Case studies – sewa ilities. Templetion of the course, Student will be able to pop conceptual schematics required for biological treatment of ate pertinent criteria into system requirements. astewater Treatment for Pollution Control, TMH, New De erage and Sewage Treatment" CPHEEO, Ministry of ia, New Delhi, 1999. NC, "Wastewater Engineering – Treatment and Reuse, Fou	ge treat otal:	vater econd Devo ition,	plant 45 Ho I Edi elopm Tata	iion M



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		AIR POLLUTION MONITORING AND CONTROL	L	Т	P	С
			3	0	0	3
Course Ob						
	To impart	knowledge on the principles and design of control of indoor/	particul	ate/g	aseou	S
	air pollutar	nt and its emerging trends				
Unit I	Introducti				7 He	our
Structure a	nd compositi	ion of Atmosphere – Sources and classification of air pollutar	nts - Efi	fects	of air	
pollutants o	on human he	alth, vegetation & animals, Materials & Structures – E	Effects of	of air		
Pollutants of	on the atmos	phere, Soil & Water bodies – Long- term effects on the plane	t – Glo	bal C	limat	e
Change, O	zone Holes –	- Ambient Air Quality and Emission Standards – Air Pollution	n Indico	es – I	Emissi	on
Inventories	– Ambient a	and Stack Sampling and Analysis of Particulate and Gaseous	Polluta	nts.		
<b>TT 1/ TT</b>						
Unit II		ion Modelling	· •	x7' 1	5 Ho	
		on Air Pollution - Fundamentals, Atmospheric stability, Inve				es
		s- Transport & Dispersion of Air Pollutants – Modeling Tech	iniques	- All		
	limatology.				11 11	
Unit III		of Particulate Contaminants			<u>11 Ho</u>	
		ion of Control Equipment – Gas Particle Interaction, – Work				Ign
		ons of Gravity Separators (cyclone), Centrifugal separators I				
		Electrostatic Precipitators – Operational Considerations - Proc		ntrol	and	
		f APC equipment – Case studies for stationary and mobile so	urces.		44 77	
Unit IV	<b>Control of</b>				11 Ho	
		f Gaseous Contaminants	0			
		ion of Control Equipment – Working principle, Design and p				lor
of absorpti	on, Adsorptio	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr	ocess c	ontro	ol and	
of absorption Monitoring	on, Adsorptio g - Operation	ion of Control Equipment – Working principle, Design and p	ocess c	ontro	ol and	
of absorption Monitoring mobile sou	on, Adsorption g - Operations rces.	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie	ocess c	ontro	ol and ary an	d
of absorption Monitoring mobile sou <b>Unit V</b>	on, Adsorptio g - Operations rces. Indoor Air	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management	rocess c rs for sta	ontro ation	ol and ary an 11 Ho	d our
of absorption Monitoring mobile sou <b>Unit V</b> Sources typ	on, Adsorption g - Operationa rces. Indoor Ain pes and contr	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra	rocess c s for sta adon Po	ontro ationa	ary and ary an 11 Ho on and	d our
of absorption Monitoring mobile sou <b>Unit V</b> Sources type control – M	on, Adsorption g - Operation rces. Indoor Ain pes and contr Iembrane pro	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra occess - UV photolysis – Internal Combustion Engines - Source	rocess c s for sta adon Po	ontro ationa	ary and ary an 11 Ho on and	d our
of absorption Monitoring mobile sou <b>Unit V</b> Sources type control – M	on, Adsorption g - Operation rces. Indoor Ain pes and contr Iembrane pro	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra	rocess c s for sta adon Po	ontro ationa	ary and ary an 11 Ho on and	d our
of absorption Monitoring mobile sou <b>Unit V</b> Sources type control – M	on, Adsorption g - Operation rces. Indoor Ain pes and contr Iembrane pro	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra ocess - UV photolysis – Internal Combustion Engines - Sourc urement – Standards –Control and Preventive measures.	rocess c s for sta adon Po	ontro ationa ollution Effect	ary and ary an 11 Ho on and	d Dur 1 it
of absorption Monitoring mobile sou <b>Unit V</b> Sources typ control – N Noise Pollu	on, Adsorption g - Operation rces. Indoor Ain bes and contr fembrane pro- ution – Meas utcomes:	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra ocess - UV photolysis – Internal Combustion Engines - Sourc urement – Standards –Control and Preventive measures.	adon Po	ontro ationa ollution Effect	ol and ary an 11 He on and ets of	d J it
of absorption Monitoring mobile sour <b>Unit V</b> Sources type control – M	on, Adsorption g - Operationa rces. Indoor Ain pes and contra fembrane pro- ution – Meas utcomes: After comp	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra ocess - UV photolysis – Internal Combustion Engines - Sourc urement – Standards –Control and Preventive measures. Te pletion of the course, Student will be able to	adon Po	ontro ationa ollution Effect	ol and ary an 11 He on and ets of	d J it
of absorption Monitoring mobile sou <b>Unit V</b> Sources typ control – N Noise Pollu	on, Adsorption g - Operationa rces. Indoor Ain pes and contra fembrane pro- ution – Meas utcomes: After comp	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra ocess - UV photolysis – Internal Combustion Engines - Sourc urement – Standards –Control and Preventive measures.	adon Po	ontro ationa ollution Effect	ol and ary an 11 He on and ets of	d Dui 1 it
of absorption Monitoring mobile sou <b>Unit V</b> Sources typ control – N Noise Pollu	on, Adsorption g - Operations rces. Indoor Air bes and contr fembrane pro- ation – Meass itcomes: After comp 4. Apply	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra ocess - UV photolysis – Internal Combustion Engines - Sourc urement – Standards –Control and Preventive measures. Te pletion of the course, Student will be able to	adon Po	ontro ationa ollution Effect	ol and ary an 11 He on and ets of	d J it
of absorption Monitoring mobile sou <b>Unit V</b> Sources typ control – N Noise Pollu	on, Adsorption g - Operationaries <b>Indoor Ain</b> bes and contra- dembrane pro- ation – Meas <b>Itcomes:</b> After comp 4. Apply 5. Apply	ion of Control Equipment – Working principle, Design and p on, condensation, Incineration, Bio scrubbers, Bio filters – Pr al Considerations - Costing of APC Equipment – Case studie r Quality Management rol of indoor air pollutants, sick building syndrome types – Ra ocess - UV photolysis – Internal Combustion Engines - Sourc urement – Standards –Control and Preventive measures. Te pletion of the course, Student will be able to sampling techniques	adon Potal:	ontro ations	ol and ary an 11 Ho on and ots of 45 Ho	d Jur 1 it



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV203	INDUSTRIAL WASTE MANAGEMENT	L	Т	P	С
		3	0	0	3
Course Ob	9				
	To impart knowledge on the concept and application of Industrial pollut	-		on,	
	cleaner technologies, industrial wastewater treatment and residue manage	ement			
Unit I	Introduction			8 He	
	cenario in India– Industrial activity and Environment - Uses of Water by i		-	ource	<mark>S</mark>
	f industrial wastewater – Nature and Origin of Pollutants - Industrial wast				
	ntal impacts – Regulatory requirements for treatment of industrial wastewa				
	y – Industrial wastewater monitoring and sampling -generation rates, cha			<mark>ı and</mark>	
	Foxicity of industrial effluents and Bioassay tests – Major issues on water	qualit	<mark>y</mark>		
managemer	<mark>it.</mark>				
Unit II	Industrial Pollution Prevention & Waste Minimisation			8 H	
	and Control of Industrial Pollution – Benefits and Barriers – Waste manage	remen	t Hier		
	and Control of Industrial Fondton – Benefits and Barriers – waste managed				-
	Options – Cost benefit analysis – Pay-back period – Implementing & Pro				
	Programs in Industries.		9		
Unit III	Industrial Wastewater Treatment			10 He	ours
Flow and L	oad Equalization – Solids Separation – Removal of Fats, Oil & Grease- N	eutral	izatio	n –	
	f Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen				
	n exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation				
Organic Co	nstituents - Biological treatment Processes, Chemical Oxidation Processe	es, Adv	ance	b	
Oxidation p	processes – Treatability Studies.				
Unit IV	Wastewater Reuse and Residual Management			9 H	ours
Individual a	and Common Effluent Treatment Plants - Joint treatment of industrial and	l dome	stic		
wastewater	- Zero effluent discharge systems - Quality requirements for Wastewater	reuse -	– Indı	ıstrial	
reuse, Pres	ent status and issues - Disposal on water and land - Residuals of industria	l wast	ewate	r	
treatment -	Quantification and characteristics of Sludge - Thickening, digestion, con	dition	ng, d	ewate	ring
and disposa	l of sludge – Management of RO rejects.				
Unit V	Case Studies			10 He	ours
Industrial n	nanufacturing process description, wastewater characteristics, source redu	ction of	option	s and	
waste treatr	nent flow sheet for Textiles - Tanneries - Pulp and paper - metal finishin	g – Oi	l Refi	ning	_
Pharmaceut	ticals – Sugar and Distilleries				
				4 <b>8</b> 11	
<u> </u>		tal:		45 He	ours
Course Ou					
	After completion of the course, Student will be able to	dati - ·		aac -	
	5. Define the Principles of pollution prevention and mechanism of oxid	lation	proce	sses.	
	6. Suggest the suitable technologies for the treatment of wastewater.				
	<ol> <li>Discuss about the wastewater characteristics</li> <li>Design the treatment systems</li> </ol>				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV204		SOLID AND HAZARDOUS WASTE MANAGEMENT	L	Т	P	C
			3	0	0	3
<b>Course Ob</b>	jectives:					
		knowledge and skills in the collection, storage, transport, treatment				ıd
	recycling of	options for solid wastes including the related engineering princi	iples,	desig	gn	
	criteria, me	ethods and equipment.				
Unit I	Sources, C	Classification and Regulatory Framework			9 H	ours
Types and	Sources of s	solid and hazardous wastes - Need for solid and hazardous was	aste n	nanag	gemer	ıt
Salient feat	tures of India	an legislations on management and handling of municipal soli	d was	stes, l	nazaro	lous
wastes, bio	medical was	stes, nuclear wastes - lead acid batteries, electronic wastes, p	lastics	s and	fly a	sh –
		l waste management and roles of stakeholders - Financing			•	
	•	management.				
-		-				
Unit II		aracterization and Source Reduction			8 Hoi	
		and variation - Composition, physical, chemical and biologica				
		haracteristics - TCLP tests - waste sampling and characteriz			- So	urce
		aste exchange - Extended producer responsibility - Recycling a	and re			
Unit III		Collection and Transport Of Wastes	· .		9 Hoi	
		tion of wastes at source - storage and collection of munic				
		systems - Need for transfer and transport - Transfer station				
	-	ty, storage, labeling and handling of hazardous wastes – hazard	ous w	aste	mani	ests
and transpo		The Table 1 - the			10 TT.	
Unit IV		ocessing Technologies			10 Ho	
-	-	rocessing – material separation and processing technologie			-	
		technologies – methods and controls of Composting -				
		y recovery – incineration – solidification and stabilization of				
		l wastes - Health considerations in the context of operation of	I Taci	lities,	hanc	ling
	-	of outputs on the environment.				
Unit V	Waste Dis				<u>9 Hor</u>	
		- Disposal in landfills - Landfill Classification, types and met				
		of sanitary landfills, secure landfills and landfill bioreactors –				
landfill ren		ndfill closure and environmental monitoring - Rehabilitation	1 01 0	open	aum	<u>)</u> S –
landiiii ren	hediation.					
		Tot	al:		45 H	ours
Course Ou						
		pletion of the course, Student will be able to				
		stand the characteristics of different types of solid and hazard	dous v	waste	s and	the
		affecting variation				
		e and explain important concepts in the field of solid wast				and
		st suitable technical solutions for treatment of municipal and in				
		stand the role legislation and policy drivers play in stakehold				
		and apply the basic scientific principles for solving practical	wast	e ma	nager	nent
	challer	iges				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV205	1	ENVIRONMENTAL IMPACT ASSESSMENT	L	Т	Р	C
			3	0	0	3
<b>Course Ob</b>						
		pose the students to the need, methodology, documentation				
	enviro	nmental impact assessment and to develop the skill to pre-	pare	envii	onme	ental
	manag	gement plan.				
	4. To pr	ovide knowledge related to the broad field of environment	al ris	sk as	sessn	ient,
	impor	tant processes that control contaminant transport and tools t	hat c	an b	e use	d in
	predic	ting and managing human health risks.				
Unit I	Introduct	ion			8 H	ours
Historical of	development	of Environmental Impact Assessment (EIA). EIA in Project Cy	ycle.	Legal	and	
<b>Regulatory</b>	aspects in I	ndia. – Types and limitations of EIA –.EIA process- screening -	– scop	oing -	setti	ng –
analysis – 1	mitigation. C	Cross sectoral issues and terms of reference in EIA – Public Part	ticipa	tion i	n EIA	<mark>۱.</mark>
U	Imm a st Id	antification and Durdistion			10 H	
Unit II Matriaga		<mark>entification and Prediction</mark> Checklists –Cost benefit analysis – Analysis of alternatives – S	oftru			
		ns in EIA. Prediction tools for EIA – Mathematical modeling for				
		ts – air – water – soil – noise – biological — Cumulative Impac				uon
Unit III	-	pact Assessment and EIA Documentation			8 H	ours
		ent - Relationship between social impacts and change in commu	nity a	ind		
		nts. Individual and family level impacts. Communities in transi			nenta	tion
of EIA find	lings – planr	ning - organization of information and visual display materials	– Rep	ort		
preparation						
Unit IV		nental Management Plan			7 H	ours
		ment Plan - preparation, implementation and review – Mitigati				
		Policy and guidelines for planning and monitoring programmes	– Pos	st pro	ject a	udit
- Ethical at <b>Unit V</b>		spects of Environmental Impact Assessment- Case Studies.			12 H	
		nental Risk Assessment and Management essment framework-Hazard identification -Dose Response Eval	luatio			
		e Factors, Tools for Environmental Risk Assessment– HAZOP				ne
		nd fault tree analysis – Multimedia and multipathway exposure				
		racterization Risk communication - Emergency Preparedness P				risk
	nt programs.				-	
		Tota	al:		45 H	ours
Course Ou						
		pletion of the course, Student will be able to				
		stand the necessity to study the impacts and risks that will be ca	aused	by p	rojec	ts or
	indust	ries and the methods to overcome these impacts.				
	4. Know	about the legal requirements of Environmental and Risk Assess	sment	t for j	orojec	:ts.



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

	06	UNIT OPERATIONS AND PROCESSES	L	Т	Р	C
		LABORATORY				
			0	0	2	1
Course	<b>Objectives:</b>					
		evelop the skill for conducting Treatability studies of wat				ater
		ent by various Unit Operations and Processes using laboratory				
		evelop the skill for conducting Treatability studies of wat				vater
		ent by various Unit Operations and Processes using laboratory	scale	mod	els.	
	Experiments:					
	gulation and Fl					
	ch studies on se					
		n- Characteristics of Filter media				
	ter softening					
	sorption studies/					
		Silt Density Index				
		ded growth process (activated sludge process)- Sludge volume I	ndex			
		systems / kinetics (Demonstration)				
		on Processes – (Ozonation, Photocatalysis)				
	infantion fan Du	in Irin a stratan				
20. Dis	infection for Dr	inking water	Tot	al	45 U	01116
20. Dis	infection for Dr	inking water	Tot	al	45 Ho	ours
		inking water	Tot	al :	45 Ho	ours
	Outcomes:		Tot	al :	45 Ho	ours
	Outcomes: After com	pletion of the course, Student will be able to	Tot	al :	45 Ho	ours
	Outcomes: After com 3. Condu	pletion of the course, Student will be able to act treatability studies for water and waste water treatment.	Tot	al :	45 Ho	ours
	Outcomes: After com 3. Condu 4. Design	pletion of the course, Student will be able to	Tot	al :	45 Ho	ours
Course	Outcomes: After com 3. Condu 4. Design nces:	pletion of the course, Student will be able to act treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes.		:		
Course Referen 5. Me	Outcomes: After com 3. Condu 4. Design nces: tcalf and Eddy.	pletion of the course, Student will be able to tet treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Re		:		
Course Referen 5. Me Tat	Outcomes: After com 3. Condu 4. Design nces: tcalf and Eddy. a McGraw Hill	pletion of the course, Student will be able to ict treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Re Publishing Company Limited, New Delhi, 2003.	euse, '	:	1 Edi	tion
Course Referen 5. Me Tat 6. Lee	Outcomes: After com 3. Condu 4. Design Aces: tcalf and Eddy. a McGraw Hill c, C.C. and Shu	pletion of the course, Student will be able to tet treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Re	euse, '	:	1 Edi	tion
Course Referen 5. Me Tat 6. Lee Nev	Outcomes: After com 3. Condu 4. Design tcalf and Eddy. a McGraw Hill c, C.C. and Shur w York, 1999.	pletion of the course, Student will be able to tet treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Re Publishing Company Limited, New Delhi, 2003. n dar Lin. Handbook of Environmental Engineering Calculation	euse, ' ons, N	:	1 Edi braw 1	tion Hill
Course Referen 5. Me Tat 6. Lee Nev 7. Cas	Outcomes: After com 3. Condu 4. Design nces: tcalf and Eddy. a McGraw Hill c, C.C. and Shu w York, 1999. eey T.J., Unit T	pletion of the course, Student will be able to ict treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Re Publishing Company Limited, New Delhi, 2003.	euse, ' ons, N	:	1 Edi braw 1	tion Hill
Course Referen 5. Me Tat 6. Lee New 7. Cas Lor	Outcomes: After com 3. Condu 4. Design tcalf and Eddy. a McGraw Hill c, C.C. and Shu w York, 1999. bey T.J., Unit T ndon, 1993.	pletion of the course, Student will be able to tet treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Re Publishing Company Limited, New Delhi, 2003. n dar Lin. Handbook of Environmental Engineering Calculation Freatment Processes in Water and Wastewater Engineering,	cuse, ' ons, N John	:	1 Edi Graw 1 eys S	tion Hill ons
Course Referen 5. Me Tat 6. Lee Nev 7. Cas Lor 8. Dav	Outcomes: After com 3. Condu 4. Design tcalf and Eddy. a McGraw Hill c, C.C. and Shu w York, 1999. bey T.J., Unit T ndon, 1993.	pletion of the course, Student will be able to tet treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Re Publishing Company Limited, New Delhi, 2003. n dar Lin. Handbook of Environmental Engineering Calculation	cuse, ' ons, N John	:	1 Edi Graw 1 eys S	tion Hill ons



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV001		AIR POLLUTION METEOROLOGY AND MODELING	L	Т	Р	C
			3	0	0	3
Course Ob	jectives:		_			
	To introdu	ce the emerging concepts of climate modeling and projecting f	uture	clima	ate	
	-	derstand data analysis and application.				
Unit I		ric Pollution				ours
particles, e	mission inve	type of pollutants, gaseous and particulate pollutants, size of a ntory, various sources of emissions, bio-mass burning, pollutic and Acid Deposition Industrial pollution.				
Unit II	<b>Meteorol</b>	<mark>ygy</mark>			9 H	ours
		gy: sources of air pollution, methods for air pollution measure				
		that contribute to air quality degradation, basic chemistry of the				
		condary pollutant formation. Effect of air pollution on Human of particulate pollutants in the respiratory system.	health	n, ma	terial	and
vegetation,	Deposition					
Unit III	<b>Transport</b>					ours
-		transport models, box models, three-dimensional atmospheric of			-	ort
		air quality forecasting and modelling, evaluation and validatio				
standards a	nd index, lo	ng range transport of pollutants. Back trajectory construction a	nd app	plicat	ions	
Unit IV	<b>Dispersio</b>	1 Models			9 H	ours
-	-	n of air pollutants - wind velocity, wind speed and turbulence;		-		
		int sources - the Gaussian Equation - atmospheric stability - Ai	r poll	ution		
modelling	and prediction	on - Plume rise, modelling techniques.				
Unit V	Software 1	Modelling			9 H	ours
Exposure t	o computer r	nodels for air quality.				
		Tot	al:		45 H	ours
Course Ou						
		pletion of the course, Student will be able to				
		the causes of climate change				
		the effects of climate change on various environments and vari	ious n	nodel	s.	
References		VN. "Air Dallytian" Tata MaCrowy IIII 2006				
		V.N., "Air Pollution", Tata McGraw Hill,2006.	<u> </u>		1 (	
		l, Donald L. Fox, D.Bruce Turner& Arthur C. Stern, "F	unda	ment	ais oi	Air
	on, Hardcov					
		cil F. Warn, "Air pollution its origin and control", 2007.			T	NT -
	-	'Surface Water quality modeling", The McGraw-Hill-C	ompa	nies	Inc., I	New
York,	1997.					



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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17EV002		CLIMATE CHANGE AND MODELING	L	T	P	C
			3	0	0	3
Course Ob						
		ice the emerging concepts of climate modeling and projecti	ng future	clima	ate	
		nderstand data analysis and application.				
Unit I		Change and Climate Variability			9 He	
Introduction	n – Atmosp	here - weather and Climate - climate parameters (Temperat	ure ,Rain	fall, F	Iumic	lity
Wind etc) -	- Equations	governing the atmosphere - Numerical Weather Prediction	Models -	Intro	ductio	on
to GCMs -	Application	in Climate Change Projections.				
Unit II	IDCC SD	ES Scenarios			0.11	
		el on Climate Change (IPCC) - An Overview - Key Assum	ntiona S	00000	<u>9 Ho</u>	Jur
•		, B1, A2, B2).	ptions - S	Cenar	10	
Unit III	Global Cl	limate MODEL (GCM) and Regional Climate Model (R	CM)		9 H	our
Somo train		HadCM3Q-UK Met Office) - Issues with GCMs - Introduct	ion to DC		nd T A	M
• •		-				
• 1		ike PRECIS, Sim CLIM, MAGICC/SCENGENE - Advanta	ages and I	Jisad	vanta	ges
of GCMs a	nd P('Ma					
	nu keivis.					
Unit IV		ing Global Climate Model - An Overview			9 H	our
	<b>Downscal</b>	l <mark>ing Global Climate Model - An Overview</mark> - Selection of GCMs for regional climate change studies - H	Ensemble	theor		our
Need for do	<b>Downscal</b>	- Selection of GCMs for regional climate change studies - H			у –	
Need for do Selection of	<b>Downscal</b> ownscaling f - Ensembl	- Selection of GCMs for regional climate change studies - I es, Model Domain (Spatial domain and temporal domain),	Resolutio	n and	y – l clim	ate
Selection of variables - ]	<b>Downscal</b> ownscaling f - Ensembl Lateral bour	- Selection of GCMs for regional climate change studies - I es, Model Domain (Spatial domain and temporal domain), ndary conditions - Methods of downscaling (Statistical and	Resolutio	n and	y – l clim	ate
Need for do Selection of variables - I from each a	<b>Downscal</b> ownscaling f - Ensembl Lateral bour and their lim	- Selection of GCMs for regional climate change studies - I es, Model Domain (Spatial domain and temporal domain), ndary conditions - Methods of downscaling (Statistical and nitations.	Resolutio	n and	y – l clim examp	ate ples
Need for do Selection o variables - I from each a <b>Unit V</b>	<b>Downscal</b> ownscaling f - Ensembl Lateral bour and their lim Analysis /	- Selection of GCMs for regional climate change studies - I es, Model Domain (Spatial domain and temporal domain), ndary conditions - Methods of downscaling (Statistical and nitations. Post Processing	Resolutio Dynamic	on and al) - e	y – l clim examp 9 He	ate ples
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV005		ENVIRONMENTAL POLICIES AND LEGISLATION	L	Т	P	С
			3	0	0	3
Course Ob	9					
	-	knowledge on the policies, legislations, institutional frame wo	ork and	l enfo	orcem	ent
		ns for environmental management in India.				
Unit I	Introduct				9 H	ours
		and Environmental Protection – National Environmenta			—	
		e and Polluter Pays Principle – Concept of absolute liability –				
	-	ents and Protocols – Montreal Protocol, Kyoto agreement, Rig	o decla	ratioi	1—	
		ion Act, Water (P&CP) Act, Air (P&CP) Act – Institutional				
framework	(SPCB/CPC	B/Molf)				
Unit II	Water (P	&CP) Act, 1974			8 H	ours
Power & fu	inctions of r	regulatory agencies - responsibilities of Occupier Provision rel	ating t	o pre	ventio	n
and control	Scheme of	Consent to establish, Consent to operate - Conditions of the c	onsent	s - O	utlet	_
Legal samp	ling proced	ures, State Water Laboratory - Appellate Authority - Penaltie	s for v	iolati	on of	
consent cor	nditions etc.	Provisions for closure/directions in apprehended pollution sit	uation			
TI 24 TTT		ND) A -4 1001			8 H	
Unit III		CP) Act, 1981 egulatory agencies - responsibilities of Occupier Provision rel	atina t			
		Consent to establish, Consent to operate – Conditions of the c	•	-		
		ures, State Air Laboratory – Appellate Authority – Penalties				
-	• •	Provisions for closure/directions in apprehended pollution sit			1 01	
Unit IV		nent (Protection) Act 1986			13 H	
		elegation of powers – Role of Central Government - EIA Notif			•	
		one Regulation - Responsibilities of local bodies mitigation				
-		Management - Responsibilities of Pollution Control Boards				
		foccupier, authorization – Biomedical waste rules – responsib	lities of	of ger	ierato	rs
and role of	Pollution C	ontrol Boards				
Unit V	Other To	<mark>pics</mark>			7 H	ours
		Indian Forest Act, Public Liability Insurance Act, CrPC, IPC	-Publie	c Inte		
<b></b>	Writ petitio	ons - Supreme Court Judgments in Landmark cases.				
Litigation -		Jus - Supreme Court Judgments in Landmark cases.				
Litigation -					4. TT	
	4.0		tal:		45 H	ours
Litigation -		To	tal:		45 H	ours
	After com	pletion of the course, Student will be able to	tal:		45 H	ours
	After com 3. Know	To				ours



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV008		MEMBRANE TECHNOLOGIES FOR WATER AND WASTE WATER TREATMENT	L	T	Р	C
		WASTE WATER TREATMENT	3	0	0	3
Course O	bjectives:			1	Ĵ	1
		e the concept and principles of membrane separation and i	ts applic	ation	s in w	ater
		ater treatment.				
Unit I		Filtration Processes	. 01		10 H	
Flow filt	ration - Mem	systems- Theory of Membrane separation – mass Transpor prane Filtration- Flux and Pressure drop -Types and commetric and asymmetric – Plate and Frame, spiral wound a embranes	hoice of	mem	brane	
Unit II	<b>Membran</b>	e Systems			10 H	ours
process c Pervapora Liquid ma componen Economic <b>Unit III</b> Introducti	ontrol and ap tion – Liquid embrane - Me tts – Design o s of Membran Membran on and Histor	applications – Reverse Osmosis: Theory and design of mo- plications – Electro dialysis : Ion exchange membranes, membrane – Liquid Pertraction – Supported Liquid Memb mbrane manufactures – Membrane Module/Element desig Membrane systems - pump types and Pump selection– Pla e systems <b>Bioreactors</b> cal Perspective of MBRs, Biotreatment Fundamentals, Bio Fouling Control, MBR Design Principles, Design As	process rane and ns – Mer ant opera	desig Emu mbran tions	n- lsion ne Sys - <b>9 H</b> con M	stem ours BR
MBR Con		ommercial Technologies, Case Studies.			8 H	ours
Membran	e Fouling – C – monitoring	ontrol of Fouling and Concentration Polarisation-Pretreatm of Pretreatment – Langlier Index, Silt Density Index, Cher			nd	<i>5</i> <b>U</b> I 3
Unit V	Case Stud	<mark>es</mark>			<u>8</u> H	ours
		gn of membrane-based water and wastewater treatment sys s – Desalination of brackish water.	stems – z	ero L	iquid	
			Fotal:		45 H	ours
Course C						
	1. familia applica			chani	sms,	and
		and the selection criteria for different membrane processes				
		e principle of the most common membrane applications	1			
	4. Carry o	ut design of project for a particular membrane technology	applicati	on.		



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV009		REMOTE SENSING AND GIS APPLICATIONS IN	L	Т	P	C
		ENVIRONMENTAL MANAGEMENT		0		
Course Ob	viectives:		3	0	0	3
		cate the students on aspects of Remote Sensing				
		op the different remote sensing technique				
		icate the students on aspects of GIS and data management				
		pp the GIS Applications for monitoring and management of en	nviron	ment		
Unit I	Remote Se	nsing Elements			8 H	our
Historical I		Principles of remote sensing, components of Remote Sensing,	, Energ	y sou	irce a	nd
•		on, Electromagnetic spectrum, Energy interaction, Spectral Energy recording technology.	l respo	nse p	attern	of
Unit II	Remote Se	ensing Technology			9 H	our
		e Sensing Systems, Aerial photographs, Photographic system				
-	-	lultispectral remote sensing, Thermal remote sensing, Microw	vave re	mote	sensi	ng
- Active an	iu passive sei	nsors, RADAR, LIDAR				
	1				9 H	ours
Unit III Social impa institutiona	Social Imp act assessment al arrangement	Dact Assessment and EIA Documentation nt - Relationship between social impacts and change in comm nts. Individual and family level impacts. Communities in trans	sition l	Docui	9 He	
Unit III Social impa institutiona of EIA find	Social Imp act assessment al arrangement dings – plann	oact Assessment and EIA Documentation nt - Relationship between social impacts and change in comm	sition l	Docui		
Unit III Social impa institutiona of EIA find preparation Unit IV	Social Imp act assessment al arrangement dings – plann n. Environm	<b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in comm nts. Individual and family level impacts. Communities in trans- ing – organization of information and visual display materials ental Management Plan	sition l s – Rep	Docui port		tion
Unit III Social impa institutiona of EIA find preparation Unit IV Environme Rehabilitat	Social Imp act assessment al arrangement dings – plann n. Environm ental Managest tion Plans – F	<b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in comm nts. Individual and family level impacts. Communities in trans- ing – organization of information and visual display materials	sition I s – Rep tion ar	Docui port	nenta	ution
Unit III Social impa institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical an	Social Imp act assessment al arrangement dings – plann n. Environm ental Managest tion Plans – F nd Quality as	<ul> <li>Dact Assessment and EIA Documentation</li> <li>nt - Relationship between social impacts and change in communities. Individual and family level impacts. Communities in transing – organization of information and visual display materials</li> <li>Dental Management Plan</li> <li>ment Plan - preparation, implementation and review – Mitiga</li> <li>Policy and guidelines for planning and monitoring programmed</li> </ul>	sition I s – Rep tion ar	Docui port	nenta	ours ours
Unit III Social impa institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical an Unit V Environme Assessmen methods – contaminar	Social Imp act assessment al arrangement dings – plann n. Environm ental Managest ion Plans – F nd Quality as Environm ental risk asset t – Exposure Event tree ar nt- Risk Char	<ul> <li>Dact Assessment and EIA Documentation</li> <li>nt - Relationship between social impacts and change in communities. Individual and family level impacts. Communities in transing – organization of information and visual display materials</li> <li>Dental Management Plan</li> <li>ment Plan - preparation, implementation and review – Mitiga</li> <li>Policy and guidelines for planning and monitoring programmes</li> <li>spects of Environmental Impact Assessment- Case Studies.</li> </ul>	sition I s – Rep tion an es – Po aluatio P and F re mod	Docum port d st pro n – E FEMA leling	nenta 10 Ho iject a 9 Ho xpost	our: our: our: our:
Unit III Social impa institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical an Unit V Environme Assessmen methods – contaminar	Social Imp act assessment al arrangement dings – plann n. Environm ental Managest ion Plans – F nd Quality as Environm ental risk asset t – Exposure Event tree ar	<ul> <li>act Assessment and EIA Documentation</li> <li>nt - Relationship between social impacts and change in communities. Individual and family level impacts. Communities in transing – organization of information and visual display materials</li> <li>ental Management Plan</li> <li>ment Plan - preparation, implementation and review – Mitiga</li> <li>Policy and guidelines for planning and monitoring programmes</li> <li>spects of Environmental Impact Assessment- Case Studies.</li> <li>ental Risk Assessment and Management</li> <li>essment framework-Hazard identification -Dose Response Evert for Environmental Risk Assessment – HAZOF</li> <li>and fault tree analysis – Multimedia and multipath way exposuracterization Risk communication - Emergency Preparedness</li> </ul>	sition l s – Rep tion an es – Po aluatio P and F re mod Plans -	Docum port d st pro n – E FEMA leling -Desi	nenta <b>10 H</b> ject a <b>9 H</b> xpost of gn of	ours ours uudi ure
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Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA) Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

### **BE CIVIL ENGINEERING**

1902CE401	BUILDING MATERIALS AND MANAGEMENT	L	Т	Р	С
		3	0	0	3
	BUILDING MATERIALS			9 Ho	
	mber and its Products, Floor and Wall Tiles, Pozzolanas, Ferrous r				
	ing Materials: Glass, Timber, Aluminum, Plastics, Paints, Varnishes,				
and Damp Proo for earth reinfor	fing Materials, Ferrocement and its application, Fabre textiles – Geo n	nembranes	and Ge	otext	iles
	BUILDING COMPONENTS			9 Ho	1186
	d Cavity wall, Composite Masonry, Doors, Windows, Ventilators, Sta	airs Lift R	mne	7 110	uis
	Termite Treatment, Brick masonry- Bond- Jointing-Stone masonry	alls, Lilt, K	amps,		
	ling structures - Site Clearance - Marking –Earthwork, Slip and movin	ng forms so	affold	ing	
	anitation, Fire Protection, Introduction to Building Maintenance, Acou				
Insulation.					
UNIT III	SUB STRUCTURE AND SUPERSTRUCTURE TECHNIQUES			9 Ho	urs
	ox jacking- pipe jacking- under water construction of diaphragm walls				
	iques, caisson -sinking cofferdam, Dewatering and stand by plant equ			round	1
	, Launching girders, bridge decks, off shore platforms, braced domes	and space d	ecks.		
	CONSTRUCTION EQUIPMENTS			9 Ho	urs
	ipment for earth work - types of earthwork equipment, Equipment for				
erection of struc	tures, Equipment for dredging, trenching, tunneling, Equipment for co	ompaction,	batchii	ng and	1
	creting, Equipment for foundation and pile driving.			9 Ho	1116
	gement - Material Procurement and Delivery - Inventory Control - Tra	adeoffs of (	osts in		urs
Materials Mana			USIS III		
COURSE OUTCO		Total:	4	5 Ho	urs
COURSE OUTCO		Total:	4	5 Ho	urs
		Total:	4	5 Ho	urs
		Total:	4	5 Ho	urs
11. Summari	MES:	Total:	4	5 Ho	urs
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11. Summari 12. Illustrate 13. Explain t	MES: ze the most common and advanced materials used for construction. the construction process of various building components.	ture and sup	er stru	cture	
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Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE505	_	ENVIRONMENTAL ENGI	NEEERING		T	P	<u>C</u>
Course Obies	4:			3	0	0	3
Course Object	1	examine the water supply system and ear	vovence system				
		examine the water supply system and con create an ability to evaluate the water treat		ad water tra	tmon	t avata	
		train the students to analyze water distribution					em.
		understand the importance of planning an			lang	5.	
		create an ability to design the waste water					
		· ·					
		impart the signification of disposal of Sev	-				
Unit I		UPPLY SYSTEMS – SOURCE AND CO		~			ours
		casting – Design period – Water demand					
		ificance –Standards – Intake structures –	Conveyance – Hy	draulics –	Layın	g, 1011	nting
		selection – Appurtenances.	100		-	0.11	
Unit II		RINCIPLES OF WATER TREATMEN		1.			ours
		unit operations and processes – Princip					
		ples of flash mixer, flocculator, clarifiers					
	on – Aera	n – Iron removal – Defluoridation – Op	peration and main	itenance asp	bects	– Res	sidue
management.	DICTDU	mon				0.11	
Unit III	DISTRI		E				ours
		ribution -Components -Service reservoirs					
		vorks – Hardy cross method – Equivalent			ances	-opera	ation
Unit IV		ction, Methods. House service connection		ong.		0.11	
		SE SUSTEM COLLECTION AND TO					
		GE SYSTEM, COLLECTION AND TR		1			
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Sources of was significance –	stewater – Effluent d	antity of sanitary sewage – Storm runof posal stand over – Design of sewers – C	f estimation – Wa			ristics	and
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Sources of was significance – testing of sewe Unit V Objectives – So chamber, grit of Trickling filter – Sewage farm Disposal on la reclamation teo Course Outco Garg, S.K., En Punmia, B.C., Newsletter, 200 Manual on Sew Government of	stewater – Effluent d rs – Sewer SEWAG election of hamber, pr –Stabilizat ing. and – Disp hniques. mes: After cor 11. 12. 13. 14. 15. vironmenta Jain, A.K., 05 verage and f India, Nev	antity of sanitary sewage – Storm runoff oosal stand over – Design of sewers – C purtenances – Pump selection. <b>TREATMENT AND DISPOSAL</b> it operation and process – Design principl ary sedimentation tanks, activated sludge n ponds – Septic tanks with soak pits – Sh cal into water bodies – Oxygen sag cur letion of the course, Student will be able to esign the components of the transmission n esign the water treatment units based on its tend the water distribution to the individua ild a sewerage system by flow estimation esign the treatment units for the treatme antity. Congineering Vol. II, Khanna Publishers, Ne d Jain.A., Environmental Engineering, Vo wage Treatment, CPHEEO, Ministry of U	f estimation – Wa computer applicati es of primary and process – Aeration idge: treatment and rve – Streeter Ph sonain for the water of principles and fur al buildings and designing suits nt of waste water ew Delhi, 2003. I.II, Lakshmi Publi rban Development	ons – Layin secondary th n tank and o d disposal – elp's mode <b>Total:</b> conveyance netions able size of r based on ications,	ng, jo reatmo xidati Bioga I – V	ristics inting <b>9 H</b> ent, sc ion dit s reco Vastev <b>45 H</b>	ance ance ourse ance ourse overy vater



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE552		ENVIRONMENTAL ENGINEERING LAB	L	Т	P	C
			0	0	2	1
Course Object	tives:					
×	1. To know t	he basics, importance of water and wastewater treatment and met	10ds n	ieasu	remer	ıt.
		he various effects of water and waste water pollution.				
	-	BOD and COD				
		Calcium, Potassium and Sodium				
		etal effects and finding methods				
List of experir						
	-	H, Electrical conductivity and turbidity				
22. Detern	nination of C	Calcium, Potassium and Sodium				
23. Detern	nination of P	hosphate and Sulphate				
24. Detern	nination of C	Optimum Coagulant Dosage by Jar test apparatus				
25. Detern	nination of a	vailable Chlorine in Bleaching powder and residual chlorine in wa	ıter			
26. Detern	nination of A	Ammonia Nitrogen				
27. Estima	ation of susp	ended, volatile and fixed solids				
28. Deterr	nination of I	Dissolved Oxygen				
<mark>29. Estima</mark>	ation of B.O.	D				
<mark>30. Estima</mark>	ation of C.O.	D				
			Tot	al:	45 H	ours
<b>Course Outco</b>						
		pletion of the course, Student will be able to				
	1.character	ize given water and waste water sample				
<b>References:</b>						
		examination of water and wastewater, APHA, 20th Edition, Wash	nington	n, 19	98	
2. Garg, S.K., '	'Environmer	ntal Engineering Vol. I & II", Khanna Publishers, New Delhi				
		ntal Engineering Vol. I & II", Standard Book House, Delhi-6				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE603		HYDROLOGY AND WATER RESOURCES ENGINEERING	L	Т	P	С
			3	0	0	3
<b>Course Objec</b>	ctives:					
		the student to the concept of hydrological aspects of mentsand should be able to quantify, control and regulate the				
Unit I	<b>PRECIPI</b>	ATION AND ABSTRACTIONS			9 Ho	ours
Hydrological	l cycle-]	Meteorological measurements-Requirements, types	ar	nd	for	ms
ofprecipitatio	on-Rain Gau	ges-Spatial analysis of rainfall data using Thiessen and Is	sohy	vetaln	netho	ds-
Interception-	Evaporation	Horton's equation, pan evaporation measured	sure	ment	s a	nd
evaporations	uppression-I	nfiltration-Horton's equation-double ring infiltrometer, infiltr	ratio	n ind	lices	
Unit II	RUNOFF				9 Ho	ours
Watershed, c	atchment ar	d basin-Catchment characteristics-factors affecting runoff-R	Run	offes		
		s table and SCS methods-Stage discharge relationshipsflov				
Hydrograph-						
Unit III		ND DROUGHT			9 Ho	mrs
•		oodEstimation-Frequency Analysis-Flood Control-D	Defir	ition		of
		hydrological and agricultural droughts-IMD method-NDVI				
Prone Area P	0,		unui	9010	Diou	5110
Unit IV					9 Ho	11PC
						Juis
Classification	n of recent	irs General principles of design site selection spillways	പ	avoti	on or	20
		irs, General principles of design, site selection, spillways	s, ele	evatio	on–ar	ea-
capacity-stor	age estimation	on, sedimentation-life of reservoirs-rule curve	s, ele	evatio		
capacity-stor Unit V	age estimation	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT			9Но	ours
capacity-stor Unit V Origin-Class	age estimation GROUND ification and	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT types-properties of aquifers-governing equations-steady ar			9Но	ours
capacity-stor Unit V Origin-Class	age estimation GROUND ification and	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT types-properties of aquifers-governing equations-steady ar n rural and urbanareas	ndur	nstead	9Ho <mark>ly flo</mark>	ours w-
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capacity-stor Unit V Origin-Class artificial rech	age estimation GROUND ification and harge-RWH in ling: 5. How to	on, sedimentation-life of reservoirs—rule curve WATER AND MANAGEMENT types-properties of aquifers-governing equations—steady ar n rural and urbanareas Total prepare data for GIS and RS	ndur	nstead	9Ho <mark>ly flo</mark>	ours <mark>w-</mark>
capacity-stor Unit V Origin-Class artificial rech Further Read	age estimation GROUND ification and harge-RWH ing: 5. How to 6. Civil e	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT types-properties of aquifers-governing equations-steady ar n rural and urbanareas Total	ndur	nstead	9Ho <mark>ly flo</mark>	ours w-
capacity-stor Unit V Origin-Class artificial rech	age estimation GROUND ification and harge-RWH ing: 5. How to 6. Civil e omes:	on, sedimentation-life of reservoirs-rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations-steady ar n rural and urbanareas Total prepare data for GIS and RS ngineering application for various fields	ndur	nstead	9Ho <mark>ly flo</mark>	ours w-
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capacity-stor Unit V Origin-Class artificial rech Further Read	age estimation GROUND ification and harge-RWH 5. How to 6. Civil e omes: After comp 11. Explain integrat 12. Make u charact 13. Outline manage	on, sedimentation-life of reservoirs—rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations—steady at n rural and urbanareas Total prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological processe ted behavior in catchments se ofhydrological models to surface water problemsincluding eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood and ement strategies	ndur l: ees a: g bass d Dr	ndthe	9Ho ly flo 45 Ho eir	ours <mark>w-</mark>
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capacity-stor Unit V Origin-Class artificial rech Further Read Course Outco	age estimation GROUND ification and harge-RWH if 5. How to 6. Civil e omes: After comp 11. Explain integrat 12. Make u charact 13. Outline manage 14. Describ reservo 15. Illustra	on, sedimentation-life of reservoirs—rule curve WATER AND MANAGEMENT I types-properties of aquifers-governing equations—steady at n rural and urbanareas Total prepare data for GIS and RS ngineering application for various fields letion of the course, Student will be able to the key drivers on water resources, hydrological processes the key drivers on water resources, hydrological processes ted behavior in catchments se ofhydrological models to surface water problemsincluding eristics, runoff and Hydrograph the concept of hydrological extremes such as Flood and ment strategies be theimportance of spatial analysis ofrainfall and design visa	ndur I: es a: g bas d Dr wate	ndthe	9Ho ly flo 45 Ho eir	ours w-



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1901MGX01	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3
<b>Course Objectives:</b>	To facilitate the understanding of Quality Managem	ent p	orinc	ples	and
	process.				
Unit I INTROI	DUCTION			9 Ho	nrs
	quality – Evolution of quality – Definitions of quality	$v - \Gamma$			
	ality – Basic concepts of TQM – TQM Framework –				
	cosby – Barriers to TQM – Quality statements – C				
	Customer satisfaction, Customer complaints, Customer				
of quality.					
Unit II TQM PI	RINCIPLES			9 Ho	urs
	ic quality planning, Quality Councils – Employee,				
	ment, Team and Teamwork, Quality circles Recognit				
	l – Continuous process improvement – PDCA cycl	e, 58	5, K	aizen	. —
	Partnering, Supplier selection, Supplier Rating				
	OOLS AND TECHNIQUES I			9 Ho	
The seven traditional	tools of quality - New management tools - Six	sigm	a: C	once	pts,
	ons to manufacturing, service sector including IT –	Benc	ch m	arkın	- g
	Bench marking process – FMEA – Stages, Types.			0.11	
	OOLS AND TECHNIQUES II			<u>9 Ho</u>	
	ss Capability – Concepts of Six Sigma – Quality Func				
(QFD) – Tagueni quan measures.	ty loss function – TPM – Concepts, improvement nee	as –	Peri	ome	ince
	<b>FY SYSTEMS</b>			9Ho	IIFG
	ISO 9001-2008 Quality System – Elements, Docun	nento	tion		
	– ISO 14000 – Concepts, Requirements and I				
<b>e</b>	afacturing and service sectors.	Jene	1105	1	<b>X</b> 111
	Tota	al:	4	5 Ho	urs
Further Reading:					
	neering economics and cost analysis				
6. Cons	struction and planning management				
Course Outcomes:					
After co	mpletion of the course, Student will be able to				
11. U	Inderstand the concepts, dimension quality and philoso	phies	5 of 7	QM.	
	Jnderstand the principles of TQM and its strategies.				
15. F	Apply seven statistical quality and management tools.				
14. U	Apply seven statistical quality and management tools. Jnderstand TQM tools for continuous improvement. Jnderstand the QMS and EMS.				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1902CE604		GLOBAL WARMING AND CLIMATE CHANGE		L	Т	Р	C	
				3	0	0	3	
Course Obje								
	W	understand the Earth's Climate System and the arming. analyze the global warming and their effects d						
	<ul> <li>9. To comprehend the impact of climate change on society and its m measures.</li> </ul>							
Unit I	INTROD	JCTION OF GLOBAL WARMING				9 Ho	ours	
<mark>sulphur pollu</mark>	tants-oxides	w - ideal gas equation- the mole concept- sa of nitrogen - particulate - Green House Gases.				• •		
Unit II		TREADING		AN		9 Ho		
	de from veh	f carbon dioxide emissions from power gen icle - miscellaneous source of carbon dioxide-						
Unit III		EW OF CLIMATE VARIABILITY ANI	) CLIN	<mark>/A1</mark>	<mark>`E</mark>	9 Ho	ours	
		te change and climate prediction - the chem lino and global warming - global change in rec			/sica	l clir	nate	
Unit IV	BASICS (	OF GLOBAL CLIMATE				9 Ho	ours	
*	-	nena in the climate system - basics of radioact ion-land surface processes - the carbon cycle.	ive forc	ing -	- atm	nosph	eric	
Unit V	<b>PHYSIC</b>	L PROCESSES IN THE CLIMATE SYST	<mark>EM</mark>			Но	9 ours	
		tum-equation of state- temperature equation plied to moisture – saturation - wave process						
			Tota	l:	4	5 Ho	ours	
Course Outo								
	<ol> <li>1.Outline</li> <li>2. Explain</li> <li>3. Illustrat</li> </ol>	bletion of the course, Student will be able to the principle involved in the greenhouse gas en the carbon emission and its mitigation method e about the climate variability parameters. the climate components and the circulation sy	s.					
		about the physical processes involved in the cl		vsten	n.			



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

1903CE033	WATER POLLUTION AND MANAGEMENT		L	Т	P	C
			3	0	0	3
<b>Course Objec</b>	ives:					
	9. To impart knowledge on the importance and necessity of	water				
	10. To educate about the water pollution and its impact					
	11. To impart knowledge on water quality analyzing techniqu					
	12. To make awareness in monitoring and management of wa	ter				
Unit I	WATER RESOURCES					ours
	operties of water –Water resources of the world and India –Nation urface sources –Water Quality Parameters – Standards.	al Water P	olicy	– Wa	iter cy	vcle–
Unit II	WATER POLLUTION				9 H	ours
Sources - Clas	sification, nature andToxicology of water pollutants -Ground wate	pollution-	–Oce	an Po	ollutic	on by
toxic wastes-I	River pollution-A case study	-				-
Unit III	EFFECTS OF WATER POLLUTION					ours
	erpollutants on Human health- Ecologicaland Economic impact	ts of wat	er po	ollutio	on–M	arine
oilpollution an						
Unit IV	ANALYSIS & INSTRUMENTATION					ours
Analysis of	Pollutants: Titrimetry – Gravimetry – Spectrophotometry –	Chromat	togra	phyar	nd F	lame
	rumentation: Principles and Applications of UV- VIS Spectropho	ometer –	Flam	e Pho	otome	ter –
	tion Spectrophotometer –Gas Chromatography – GLC – HPLC					
Unit V	MONITORING & MANAGEMENT					ours
	monitoring-Water (Prevention and Pollution Control) act 1974	<ul> <li>Pollution</li> </ul>	n con	ntrol	devic	es –
Polluters pay p	rinciple.					
		Tota	ıl:		45 H	ours
<b>Further Read</b>						
	5. Water supply engineering					
	6. Waste water engineering					
<b>Course Outco</b>						
	After completion of the course, Student will be able to					
	11. Illustrate about the sources of water and the quality standards					
	12. Classify the nature of pollutants and its source					
	13. Outline the effects of water pollution on biodiversity					
	14. Select the suitable analysis technique for the water quality para	meter esti	matic	n		
	15. Select the accurate monitoring and management methods					
<b>References:</b>						
7. Laurent H	odges – Environmental Pollution					
8. Willard, N	ferritt and Dean – Instrumental Analysis					
	Analysis of Water and Waste Water					
<i></i>	inaryono or trator and trable trator					



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1901HS002	INTELLECTUAL PROPERTY RIGHTS F ENGINEERS	OR L	Т	Р	C
		3	0	0	3
PREREQUISITE	· · · · · · · · · · · · · · · · · · ·		•		
cover trade conte	arse assumes no prior skill or background in design, the fundamental aspects of intellectual property (IP) arks, patents, geographical indications, and industria porary issues impacting the IP field such as: new pla ment of IP rights and emerging issues in IP.	: copyright and l designs. It als	l related so cove	l rights rs	,
COURSE OBJEC					
	5. A foundation in the basic conceptsof IP				
	6. Better understanding of therelationship betwee health, climatechange, traditional knowledge at				such as
	oduction			9 H	
	Copyright, Trademarks, Geographical Indicators, ement of IP Rights, Emerging Issues in IP & IP Mar		igns, F	atents,	Unfair
	yrights &Trademarks			6 H	
1 .	Study, Historical background, Principles, Notion	of Work, Rig	ghts an	d Lim	itations
Formats & Filing					
	graphical Indicators & Industrial Designs				ours
The concept, Cas	Study Histomical healtonound Dimainles Nation	of Work Ri			totiona
	Study, Historical background, Principles, Notion	of work, Mg	ghts an	a Lim	nations
Formats& Filing	ocedures		ghts an		
Formats& Filing Module IV Pat	ocedures ts			15 I	Iours
Formats& Filing   Module IV   Pat The Macro-Econo	ocedures its ic Impact of the Patent System, The Patent Applic	ation Process,	The D	15 H	Hours Layers
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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PREREQU		rse assumes no prior skill or background in design, art, engined	ering c	r protot	vning	It is
		all undergraduates and graduate students with an interest in lea				
		y recommended for those students planning social-venture and				
	intervent				0	
COURSE	OBJECTI	VES:				
		erstand how teaching and learning occurs in the design process				
	14. Reco	ognize the ethical and social dilemmas and obligations of the p	ractice	of desig	gn	
	15. Diag	nose common adoption barriers in individuals, groups and org	ganizati	ons.		
	16. Deve	elop a design theory from independent and qualitative research	and o	oservati	ons	
	17. Parti	cipate in and lead innovation in creative and collaborative sett	ings			
	18. Und	ertake complex and unstructured problem-solving challenges i	n unfa	niliar d	omains	
Module I	Introd	luction to Design Thinking			8 H	
		esign, Why Design Thinking, 5-Step Design Thinking Pro	cess, A	Applicat	tions, (	Creativ
		ture of Innovation				
Module II		<mark>1 Thinking Approach</mark>				Iours
		Design Thinking, Divergent Thinking & Innovation Funnel,				Maps t
		Opportunities, Case Study : Turing Creative Ideas into Viab	le Cor	npanies		
Module II		oring Design Thinking ToolKit			5 H	ours
		ation, Ideation, Experimentation, Evolution			5 H	
		<mark>1 Challenge Project: Phase-1</mark> Project Plan, How Might We statement, Project Timeline, F	Project	Checkl		ours
		1 Challenge Project: Phase-2	Tojeci	CHECKI		Iours
		tand the Challenge, Prepare Research, Gather Inspiration, 1	nternr	etation		
		, Frame Opportunities, Ideation – Generate Ideas, Refin				
		et Feedback, Evolution – Track Learnings, Engage Others		-, <b>r</b>		
				TOTA	L: 45 I	HOUR
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		cepts and basics of Design Thinking Principles				
		gn Thinking Approach through IDEO's method & Customer Jo				
		views and synthesize learnings to uncover insights and identify	oppor	tunities	for inn	ovatio
		riven Innovative Solutions to RealWorld Problems				
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		n for Social Impact: How to by IDEO.org				
		n Thinking ToolKit by IDEO.org eld guide to Human Centered Design by IDEO.org				
REFEREN						
		e: Unleashing the Creative Potential Within Us AllBook by Da	avid M	. Kellev	and To	om
1.Creative	Commuteric	$\nabla$ . Onleasning the Creative rotential within US Andook by $D_{i}$				
		e. Onleasning the creative rotential within Os Anbook by Da		5		
Kelley, 201	3	How Design Thinking Transforms Organizations and Inspires		•		



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Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

1901MGX07		UNIVERSAL HUMAN VALUES & ETHICS	L 3	<u>T</u> 0	P 0	C 3
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	<ol> <li>To he basic gu</li> <li>To he 'really w</li> <li>To he being.</li> <li>To far and live</li> <li>To far</li> </ol>	Ip students distinguish between values and skills, and un idelines, content and process of value education. Ip students initiate a process of dialog within themselves vant to be' in their life and profession Ip students understand the meaning of happiness and pros- cilitate the students to understand harmony at all the leve accordingly. cilitate the students in applying the understanding of harm fession and lead an ethical life	to kn sperity Is of I	ow v 7 for huma	what a hu an liv	they man ing,
Unit I	Course	Introduction - Need, Basic Guidelines, Content and	d		9 H	ours
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look at basic the basic req priority - Un	Human uirement nderstand	chanism for self-exploration - Continuous Happiness Aspirations - Right understanding, Relationship and P s for fulfillment of aspirations of every human being ling Happiness and Prosperity correctly- A critical	hysic with appr	al F their raisa	acilit r cor l of	ies- rect the
		hod to fulfill the above human aspirations: understan	ding	and	livin	g 1n
harmony at v	arious le	vels	Ŭ	and		
harmony at v Unit II	arious le <sup>.</sup> Unders Myself	vels tanding Harmony in the Human Being - Harmony	in		9 H	ours
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Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order:a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers - b) At the level of society: as mutually enriching institutions and organizations

			Total:	45 Hours
<b>Further Proceedi</b>	ng:			
	3.	Analysis about Code of Conduct for Ethical & Moral v	alues	
Course Outcome				
		npletion of the course, Student will be able to		
1.	. Unde	rstand the significance of value inputs in a class	sroom and	start applying
th	iem in	their life and profession		
2.	Dist	nguish between values and skills, happines	s and acc	umulation of
pl	hysica	l facilities, the Self and the Body, Intention	and Comp	petence of an
ir	divid	ial, etc.		
3.	Und	erstand the value of harmonious relationship bas	sed on trus	t and respect
ir	their	life and profession		
4.	. Und	erstand the role of a human being in ensuring	harmony i	n society and
na	ature.			
5.	Dist	nguish between ethical and unethical practices	s, and star	t working out
th	ne stra	egy to actualize a harmonious environment whe	erever they	work.
References:			Ť	
1. A Nagraj, 1998	, Jeeva	1VidyaEkParichay, Divya Path Sansthan, Amarkantak.		
· · · · · ·		90, Science and Humanism, Commonwealth Publisher	rs.	
		uman Values, New Age International Publishers.		
4. Ivan Illich, 1974	4, Ener	gy & Equity, The Trinity Press, Worcester, and Harper	· Collins, US	A



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1902CE019		L	Т	Р	С
	COASTAL ZONE MANAGEMENT	3	0	0	3
	At the end of the semester, 1.The student shall be able to understand the coastal processes				
Course Objectives:	2. The student shall be able to understand the coastal dynamics				
<b>J</b>	3.The student shall be able to understand impacts of structures like d quays leading to simple management perspectives along the coastal		arbors	and	
Unit I	COASTAL ZONE			9 H	ours
<mark>Coastal zone – Co</mark>	oastal zone regulations – Beach profile – Surf zone – Off shore – Coast	al water	rs – E	stuari	es —
	goons – Living resources – Nonliving resources.				
	VE DYNAMICS			9 H	
- Wave energy -	on – Airy's Linear Wave theory – Deep water waves – Shallow water w Wave Decay – Reflection, Refraction and Diffraction of waves – Brea				
	s – Vertical – Sloping and stepped barriers – Force on piles. VE FORECASTING AND TIDES			9 H	
	ing – SMB and PNJ methods of wave forecasting – Classification of tid	las D	muin		Jurs
	y of tides – Effects on structures – seiches, Surges and Tsunamis.	$105 - D_0$	ai wiii	3	
	ASTAL PROCESSES			9 H	nurs
	sitional shore features – Methods of protection – Littoral currents – Co	<mark>astal a</mark> g	uifers		
	Impact of sewage disposal in seas.	ustar aq			•
	RBOURS			9 H	ours
Structures near co	ast – Selection of site – Types and selection of break waters – Need ar	ld mode	of dr	edgin	<mark>g –</mark>
				Ŭ	
Selection of area	gers – Effect of Mangalore Forest.				
Selection of area		otal:		45 H	ours
	T	otal:		45 H	ours
Further Reading	T :: ichard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Sci				
Further Reading 1.R 199 2.Q	T :: ichard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Sci	entific I	ublis		
Further Reading 1.R 199 2.Q	T ichard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Sci 9 uinn, A.D., "Design & Construction of Ports and Marine Structures", Nok Co., 1999	entific I	ublis		
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Further Reading           1.R           199           2.Q           Boo           Course Outcome           Afte           11.           12.           13.           14.	T         ichard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Sci         9         uinn, A.D., "Design & Construction of Ports and Marine Structures", Nok Co., 1999         es:         r completion of the course, Student will be able to         Describe the Coastal zone regulations,         Describe the coastal processes         Explain the wave dynamics and forecast waves         Understand the erosion and depositional shore protection	entific I	ublis		
Further Reading           1.R           199           2.Q           Boo           Course Outcome           After           11.           12.           13.           14.           15.	T ichard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Sci 9 uinn, A.D., "Design & Construction of Ports and Marine Structures", N k Co., 1999 s: r completion of the course, Student will be able to Describe the Coastal zone regulations, Describe the coastal processes Explain the wave dynamics and forecast waves	entific I	ublis		
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Further Reading           1.R           199           2.Q           Boo           Course Outcome           Afte           11.           12.           13.           14.           15.           References:           1.Ed. A.T. Ippen,           2.Dwivedi, S.T	T         ichard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Sci         9         uinn, A.D., "Design & Construction of Ports and Marine Structures", Nok Co., 1999         st         rr completion of the course, Student will be able to         Describe the Coastal zone regulations,         Describe the coastal processes         Explain the wave dynamics and forecast waves         Understand the erosion and depositional shore protection         Plan the coastal structures including harbours and tides         "Coastline Hydrodynamics", McGraw-Hill Inc., New York, 1993         N., Natarajan, R and Ramachandran, S., "Coastal Zone Management in	entific I	ublis		
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Further Reading           1.R           199           2.Q           Boo           Course Outcome           Afte           11.           12.           13.           14.           15.           References:           1.Ed. A.T. Ippen,           2.Dwivedi, S.I.           Tamilnadu", M           3.Richard Sylv	T         ichard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Sci         9         uinn, A.D., "Design & Construction of Ports and Marine Structures", Nok Co., 1999         st         rr completion of the course, Student will be able to         Describe the Coastal zone regulations,         Describe the coastal processes         Explain the wave dynamics and forecast waves         Understand the erosion and depositional shore protection         Plan the coastal structures including harbours and tides         "Coastline Hydrodynamics", McGraw-Hill Inc., New York, 1993         N., Natarajan, R and Ramachandran, S., "Coastal Zone Management in	entific I McGraw	Publis Hill	999	



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### **ME ENVIRONMENTAL ENGINEERING**

17EV102		ENVIRONMENTAL CHEMISTRY		T	P	C
			3	0	0	3
Course Ob						
		acate the students about water chemistry				
		part knowledge in the area of air and soil chemistry				
		part knowledge on the transformation of chemicals in t	the environ	ment		
Unit I	Introducti				9 He	ours
		s balance-Chemical equilibrium, acid base, solubility pr				
		photeric hydroxides, CO2 solubility in water and specie	es distribut	ion –		
Chemical k		order- 12 Principles of green chemistry.				
Unit II	Aquatic C				11 He	
Water quali		rs- environmental significance and determination; Fate				tic
environmen		zation, partitioning, hydrolysis, photochemic				
		c chemicals-Metals, complex formation, oxidation and				
		- sorption- Colloids, electrical properties, double layer	theory, env	viron	menta	1
		, coagulation.				
		ric Chemistry			7 He	
		-chemical and photochemical reactions - photochemic				
depletion -	greenhouse	gases and global warming, CO2 capture and sequestrat				
				rain-	origi	n
	sition of par	iculates. Air quality parameters-effects and determinat		rain-	origi	n
and compose Unit IV	Soil Chem	iculates. Air quality parameters-effects and determinat istry	tion.		9 He	ours
and compose Unit IV Nature and	Soil Chem	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and	ion. l ion-excha	nge r	9 Ho eactio	ours
and compose Unit IV Nature and in soil – Ag	Soil Chem composition gricultural ch	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and emicals in soil-Reclamation of contaminated land; salt	ion. l ion-excha	nge r	9 Ho eactio	ours
and compose Unit IV Nature and in soil – Ag	Soil Chem composition gricultural ch lectrokinetic	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and micals in soil-Reclamation of contaminated land; salt remediation.	ion. l ion-excha	nge r	9 Ho eactio	ours ns
and compose Unit IV Nature and in soil – Ag metals by e Unit V	Soil Chem composition gricultural ch lectrokinetic Environm	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and demicals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals	ion. l ion-excha : by leachir	nge r Ig-He	9 Ho eactio	ours ns
and compose Unit IV Nature and in soil – Ag metals by e Unit V Heavy meta	Soil Chem composition gricultural ch lectrokinetic Environm als-Chemica	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and micals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals l speciation –Speciation of Hg &As- Organic chemicals	ion. l ion-excha t by leachir s- Pesticido	nge r ng-He	9 Ho eactio eavy 9 Ho	ours ns
and compose Unit IV Nature and in soil – Ag metals by e Unit V Heavy meta Dioxins,PC	Soil Chem composition gricultural ch lectrokinetic Environm als-Chemica CBs,PAHs an	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and micals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals I speciation –Speciation of Hg &As- Organic chemicals d endocrine disruptors and their Toxicity- Nano materi	ion. l ion-excha t by leachir s- Pesticido	nge r ng-He	9 Ho eactio eavy 9 Ho	ours ns
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and compose Unit IV Nature and in soil – Ag metals by e Unit V Heavy meta Dioxins,PC composites	Soil Chem composition gricultural ch lectrokinetic Environm als-Chemica Bs,PAHs an , environmen eading To analyze tcomes: After comp	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and memicals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals I speciation –Speciation of Hg &As- Organic chemical d endocrine disruptors and their Toxicity- Nano materi- ntal applications. and create a solution for environmental issues. bletion of the course, Student will be able to	ion. l ion-excha by leachir s- Pesticide ials, CNT,	nge r ng-He es, titani	9 He eactio avy 9 He a,	ours ns
and compose Unit IV Nature and in soil – Ag metals by e Unit V Heavy meta Dioxins,PC composites	Soil Chem composition gricultural ch lectrokinetic <b>Environm</b> als-Chemica Bs,PAHs an , environmen eading To analyze tcomes: After comp 11. Disting	iculates. Air quality parameters-effects and determinat istry a of soil-Clays- cation exchange capacity-acid base and semicals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals I speciation –Speciation of Hg &As- Organic chemicals d endocrine disruptors and their Toxicity- Nano materi- ntal applications. and create a solution for environmental issues. bletion of the course, Student will be able to guish the chemistry involved	ion. l ion-excha by leachir s- Pesticide ials, CNT,	nge r ng-He es, titani	9 He eactio avy 9 He a,	ours ns
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and compose Unit IV Nature and in soil – Ag metals by e Unit V Heavy meta Dioxins,PC composites	Soil Chem composition gricultural ch lectrokinetic Environme als-Chemica EBs,PAHs an , environme eading To analyze tcomes: After com 11. Distin 12. Under 13. Identif	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and emicals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals I speciation –Speciation of Hg &As- Organic chemicals d endocrine disruptors and their Toxicity- Nano materi- ntal applications. and create a solution for environmental issues. bletion of the course, Student will be able to guish the chemistry involved stand the chemistry involved in water y and solve the air pollution related issues	ion. l ion-excha by leachir s- Pesticide ials, CNT,	nge r ng-He es, titani	9 He eactio avy 9 He a,	ours ns ours
and compose Unit IV Nature and in soil – Ag metals by e Unit V Heavy meta Dioxins,PC composites	Soil Chem composition gricultural ch lectrokinetic Environme als-Chemica EBs,PAHs an , environme eading To analyze tcomes: After com 11. Disting 12. Under 13. Identif 14. Under	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and memicals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals I speciation –Speciation of Hg &As- Organic chemical d endocrine disruptors and their Toxicity- Nano materi- ntal applications. and create a solution for environmental issues. bletion of the course, Student will be able to guish the chemistry involved stand the chemistry involved in water y and solve the air pollution related issues stand the soil related chemistry and issues	ion. l ion-excha by leachir s- Pesticid ials, CNT, <b>Total:</b>	nge r g-He es, titani	9 Ho eactic avy 9 Ho a, 45 Ho	ours ours ours
and compose Unit IV Nature and in soil – Ag metals by e Unit V Heavy meta Dioxins,PC composites	Soil Chem composition gricultural ch electrokinetic Environme als-Chemica Bs,PAHs an , environme eading To analyze tcomes: After comp 11. Disting 12. Unders 13. Identif 14. Unders 15. Identif	iculates. Air quality parameters-effects and determinat istry of soil-Clays- cation exchange capacity-acid base and emicals in soil-Reclamation of contaminated land; salt remediation. ental Chemicals I speciation –Speciation of Hg &As- Organic chemicals d endocrine disruptors and their Toxicity- Nano materi- ntal applications. and create a solution for environmental issues. bletion of the course, Student will be able to guish the chemistry involved stand the chemistry involved in water y and solve the air pollution related issues	ion. l ion-excha by leachir s- Pesticid ials, CNT, <b>Total:</b>	nge r g-He es, titani	9 Ho eactic avy 9 Ho a, 45 Ho	ours ours ours



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17EV103		ENVIRONMENTAL MICROBIOLOGY	L	T	P	<u>C</u>
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Course Ob		ma marida a basis understanding an mianchisle ou mlaure	+ + =			u ta l
		urse provides a basic understanding on microbiology relevan ring for candidates with little prior knowledge of the subject.		envir	onme	nta
		prphology, behavior and biochemistry of bacteria, fungi, pro	tozo	a vir	11666	and
		re outlined.	10200	a, vii	uses,	anc
		crobiology of wastewater, sewage sludge and solid waste treat	atme	nt pro	ocesse	s is
	also pr	ovided. Aspects on nutrient removal and the transmission ms are also covered.				
		osure to toxicology due to industrial products and byproducts a	are a	lso co	were	1
		urse provides a basic understanding on microbiology relevan				
		ring for candidates with little prior knowledge of the subject.	10 00	01111	omne	
Unit I		on And Characteristics			5 Ho	urs
		ganisms – prokaryotic, eukaryotic, cell structure, characteristic	cs, P	reserv		
		RNA, replication, Recombinant DNA technology.	,			
Unit II		and Nutrient Cycles			10 He	ur
Distribution	n of microorg	anisms – Distribution / diversity of Microorganisms – fresh an	d ma	rine,		
		surface soil, Air – outdoor and Indoor, aerosols, biosafety in La			_	
Extreme Er	nvironment –	archaebacteria – Significance in water supplies – problems and	1 con	trol.		
Transmissil	ble diseases. l	Biogeochemical cyclesHydrological - Nitrogen, Carbon, Pl	hosp	horus	,	
		Micro Organism in nutrient cycle.	1		·	
Unit III		of Microorganisms			10 He	ur
Nutrition a	nd metabolisr	n in microorganisms, growth phases, carbohydrate, protein, lip	id m	etabo	lism	
• .•			100 111	ciuoo		_
respiration,	aerobic and a	anaerobic-fermentation, glycolysis, Kreb''s cycle, hexose mono				-
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Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

15. The candidate has the ability to conduct and test the toxicity due to various natural and synthetic products in the environment.

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Unit III	Wastewat	er Collection and Conveyance			10 H	ours
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		PRINCIPLES AND DESIGN OF PHYSICO- CHEMICAL TREATMENT SYSTEMS		Т	Р	C
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Course Ob		5		U	U	5
Course On		ucate the students on the principles and process designs of va	ario		treatr	nent
		is for water and wastewater	ai 10	u.b	ti outi	nent
		acate the students on design of treatment systems and the compon	ent	S CO	mnri	sing
		ystems, leading to the selection of specific process.		.5 00	mpri	51115
Unit I	Introduct				5 He	ours
		wastewater - characteristics, Standards for performance - Signific	cand	ce o		
		Selection criteria-types of reactors- reactor selection-batch- c				
kinetics.						
Unit II	Treatmen	t Principles		1	l0 Ho	ours
Physical tr	reatment - S	creening - Mixing, Equalization - Sedimentation - Filtration -	- E	vap	oratio	on –
Incineration	n – gas tran	sfer - mass transfer coefficient Adsorption - Isotherms - Memb	oran	e se	epara	tion,
Reverse O	osmosis, nan	o filtration, ultra-filtration and hyper filtration electro dialysi	s, c	disti	llatic	n –
		zation - Recent Advances. Principles of Chemical treatment				
		ation - flotation solidification and stabilization - Disinfection		on e	excha	nge,
		olvent extraction - advanced oxidation /reduction - Recent Trends				
Unit III		Municipal Water Treatment Plants			l0 Ho	
		- Design of municipal water treatment plant units - Aerators - che	emi	cal	feedi	ng –
Floceulatic	un alamitian					
		- tube settling - filters - Rapid sand filters, slow sand filter, pre				
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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Course Ob			1 • 1		. 1 .				
		n in the analysis of p							
I. CE		in in the analysis of	chemical par	ameters of w	ater and waste w	ater			
List of Exp		ory Practices,	Onality	a a un trua 1	alibustion	e f		Glassy	
03	Laborato	ry Practices,	Quanty	control,	calibration	of	,	JIASS	vare
	ng and Anal	lysis of water (pH,	alkalinity 1	pardness chl	oride Sulphate	turbi	lity ]		
nitrate,	0	iysis or water (pri,	aikaiiiity, i		filde, Sulphate,	tur on	anty i	fluor	
	vater analysi	s (BOD, COD, Pho	osphate, TKI	N, Oil & Gr	ease, Surfactant	and	heavy	y met	als).
	ng and ana	alysis of air poll	utants Amb	vient & Sta	ack ( RSPM,	SO2	and	NO	x)
<mark>09</mark>									
15. Sampli 09	ng and	characterization	of soil	(CEC	& SAR,	pН	<u>a</u> 1	nd	<u>K)</u> .
						Tot	tal	45 H	ours
Course Ou	itcomes:						•		
	1	bletion of the course.	Student will	be able to					
	-	quality of environme							
		ct analysis on charac		vater and was	te water				
References									
11. APHA	, Standard M	ethods for the Exam	ination of W	ater and Was	stewater, 21st Ed				
12. Washir	ngton, 2005.								
13. Labora	tory Manual	for the Examination	of water, wa	stewater soil	Rump, H.H. and	l Kris	t, H.		
14. Second	l Edition, VC	CH, Germany, 1992.			• ·				
	ds of air hers,Inc,USA	sampling & ana ,1989.	alysis, Jamo	es P.Lodge	Jr(Editor) 3r	d E	ditior	n, Lo	ewis
17EV107		ENVIRONMENT	AL MICRO	BIOLOGY		L	Т	Р	C
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	3. To train	n in the analysis of p	physical para	meters of wa	ter and waste wa	ter			
		n in the analysis of c	chemical para	imeters of wa	ater and waste wa	ater			
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	ation of cultu			•					
		and Identification of							
	<u> </u>	m polluted habitats	<u> </u>	<u> </u>	walwad in history	oform	antin	<mark>.</mark>	
		owth of microorgania					latio	1	
	g of bacteria	0	sie water Alla	arysis of all o	ome microorgan	151115			
	0	rature on microbial	growth						
	1 / 1	sing microbes from	<u> </u>	luent					
		on soil microorganis							
	-	lysis of wastewater (		coli Strepto	ococcus) – MPN				
	<u> </u>	lysis of wastewater (				s			
	<u> </u>	tals on microbial gro		reproceeds	j in cominque				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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<mark>27</mark> .	Detection	on o	f Anaer	obic bacteria (Clostridium sp.)		
<mark>28</mark> .	Bioreac	tors				
					Total	45 Hours
					:	
Co	urse Ou	tcor	nes:			
		Af	ter comj	pletion of the course, Student will be able to		
		3.	Field o	priented testing of water, wastewater and solid waste for microb	oial conta	mination.
		4.	Perfor	m toxicity test.		
Re	ferences	:				
4.	Standar	d m	ethods f	for the examination of water and wastewater, American Public	Health A	Association
	(21st ec	litio	n) 2005.			
5.	Charles	Ger	ba,	Environmental Microbiology: A laboratory manu	ual, Else	vier
	Publica	tion	s, 2012.			
6.	Christo	n J.	Hurst, I	Ronald L. Crawford, Jay L. Garland, David A. Lipson, Aaron	L. Mills,	and Linda
	D. Stetz	zenb	ach, Ma	nual of Environmental Microbiology, 3rd Edition, ASM Press,	2007.	



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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			REAT	NE	111	313	511	LIV	15										3	0	0	3
Course Ob	iectives:																		5	U	U	5
	To educate for water a design of t	and treat	wastev tment s	wate: syste	er an ems	d stu and	ude	ents	s sho	oul	d ga	ain c	com	npe	tend	cy ir	n the	e pro	ocess	empl	oyed	in
Unit I	selection o	-	pecific	proc	cess																10 H	
	of biological		eatmen	t_s	sioni	ificar	nce	<b>_</b> ]	Pri	nci	nles	of	aero	ohi	c ar	nd ai	าวค	rohi	e trea			
	al growth – H																					
	efficients for				~ ~	-							-			-						·s-
	nuous type.		Sumos I		<u>ovu</u>		100	<u>1051</u>	luu	uon	ny	<b>u</b> 000	00011	1101			/101	101		<u>,00 I</u>		3
Unit II	Aerobic T	Гиол	tmont	of	Was	stow		<b></b>													10 H	0.00
	sewage treat								<u><u>c</u>1,,</u>	ida		000		nd	VOP	iotic	ma	Sac	ulona	ing D		our
reatment s charts, layc U <b>nit III</b>	ed reactors, a ystems, cons out, PID, hyd Anaerobic	istru drau <mark>ic Tı</mark>	cted w llic pro reatme	et la ofile, ent o	and - , rec <mark>of N</mark>	– Dis ent ti <mark>Vaste</mark>	sinf tren <mark>ewa</mark>	fect 1ds. <mark>ate</mark> i	tion	n —	disp	posa	ıl op	ptic	ons -	– re	clar	nati	on an	d reus	se – F 10 H	low
	nd suspendeo sposal – Nut																					
Unit IV	Sludge Tr							1 10	, , , , , , , , , , , , , , , , , , ,	Ulla	г <i></i> , г	Juyt	Jui	un	<u>, 11</u>	yuru	un	/ pro	1110		5 H	
Design of s dewatering	sludge manag (mechanical sidue disposa	agem al an	nent fac d grav	ciliti ity)	ies, s Lay	sludg vout,	ge t														sludg	
Unit V	Construct						Ma	int	tena	anc	e A	spe	cts								10 H	our
controlling	on and Opera of plant opera agement fac	erati	ions – c																e trea			
Course Ou	itcomes:																					
	After comp	plet	ion of	the o	coui	rse, S	Stu	Iden	nt w	vill	be a	able	e to									
	5. Develo	lop c	concept	tual	sch	emat	tics	s ree	qui	ired	for	· bio	olog	gica	ıl tro	eatm	nent	of	vaste	water		
	6. Transla	late	pertine	ent c	crite	ria in	nto	sys	ster	m re	equi	iren	nent	ts.								
References																						
9. Arceiva 2000.	ala, S.J., Wa	Vaste	ewater	Tre	eatm	ient i	for	r Po	ollu	utio	n C	Cont	trol,	, T	ΜH	I, N	ew	De	lhi, S	econ	d Ed	itior
Govern	l on "Sewe ment of Indi				i, 19	99.		eatn	nen	nt"	CP	ΗĒ	EO,								-	nen
11. Metcal	f & Eddy, I																_					
Graw-I	Hill Publishin pellman, Har	ing (	Compa	stew any I	Limi	ited,	, Ne	ew ]	Del	lhi,	200	03.										



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		AIR POLLUTION MONITORING AND CONTI	ROL L	T	P	C
			3	0	0	3
Course Ob	0					
	-	nowledge on the principles and design of control of i	ndoor/particu	ılate/g	aseou	S
	-	t and its emerging trends				
Unit I	Introducti				7 H	
		on of Atmosphere – Sources and classification of air				
		Ith, vegetation &         animals, Materials & Structure				
		here, Soil & Water bodies – Long- term effects on th				
Change, Oz	zone Holes –	Ambient Air Quality and Emission Standards – Air P	Pollution Indi	ces – I	Emiss	ion
Inventories	– Ambient a	nd Stack Sampling and Analysis of Particulate and G	aseous Pollu	ants.		
Unit II	Air Pollut	on Modelling			5 H	
		on Air Pollution - Fundamentals, Atmospheric stabilit	ty Inversion	Wind		
		- Transport & Dispersion of Air Pollutants – Modelin				105
	limatology.		ing reeninque	5 I <b>H</b>	L	
Unit III		Particulate Contaminants			11 He	
		on of Control Equipment – Gas Particle Interaction, -	- Working pr			
		on of control Equipment Gus Furtiere interaction,	, or wing pr	menpre		
and perform	nance equati	ons of Gravity Separators (cyclone). Centrifugal sepa	rators Fabric	filters		υ
		ons of Gravity Separators (cyclone), Centrifugal sepa lectrostatic Precipitators – Operational Consideration				U
Particulate	Scrubbers, H	lectrostatic Precipitators - Operational Consideration	s - Process C	ontrol		U
Particulate Monitoring	Scrubbers, E g – Costing o		s - Process C	ontrol		C
Particulate Monitoring <b>Unit IV</b>	Scrubbers, E g – Costing o Control of	ectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants	s - Process C obile sources	ontrol	and 11 He	Dui
Particulate Monitoring <b>Unit IV</b> Factors affe	Scrubbers, E g – Costing o Control of ecting Select	ectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig	s - Process C obile sources n and perform	ontrol	and 11 He equat	oui
Particulate Monitoring Unit IV Factors affe of absorption	Scrubbers, F g – Costing o Control of ecting Select on, Adsorption	ectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants	s - Process C obile sources n and performers – Process	ontrol nance contro	and 11 He equat ol and	oui
Particulate Monitoring <b>Unit IV</b> Factors affe of absorption Monitoring	Scrubbers, F g – Costing o Control of ecting Select on, Adsorpti- g - Operation	ectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte	s - Process C obile sources n and performers – Process	ontrol nance contro	and 11 He equat ol and	our
Particulate Monitoring Unit IV Factors affo of absorption Monitoring mobile sou Unit V	Scrubbers, E g – Costing o Control of ecting Select on, Adsorpti- g - Operation rces. Indoor Ai	ectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filt l Considerations - Costing of APC Equipment – Case Quality Management	s - Process C obile sources n and performers – Process e studies for s	ontrol nance contro tation	and 11 He equat bl and ary an 11 He	our ion id
Particulate Monitoring Unit IV Factors affo of absorptio Monitoring mobile sou Unit V Sources typ	Scrubbers, F g – Costing o Control of ecting Select on, Adsorpti- g - Operation rces. Indoor Ai pes and contr	ectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte l Considerations - Costing of APC Equipment – Case Quality Management of of indoor air pollutants, sick building syndrome typ	s - Process C obile sources n and performers – Process e studies for s pes – Radon I	ontrol nance contro tation Polluti	and 11 He equat ol and ary an 11 He on and	oui ior id
Particulate Monitoring Unit IV Factors affo of absorption Monitoring mobile sound Unit V Sources type control – N	Scrubbers, F g – Costing o Control of ecting Select on, Adsorpti- g - Operation rces. Indoor Ai bes and contri fembrane pro-	lectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte l Considerations - Costing of APC Equipment – Case Quality Management ol of indoor air pollutants, sick building syndrome typ cess - UV photolysis – Internal Combustion Engines	s - Process C obile sources n and performers – Process e studies for s bes – Radon I - Sources and	ontrol nance contro tation Polluti	and 11 He equat ol and ary an 11 He on and	oui ior id
Particulate Monitoring Unit IV Factors affo of absorptio Monitoring mobile sou Unit V Sources typ control – N	Scrubbers, F g – Costing o Control of ecting Select on, Adsorpti- g - Operation rces. Indoor Ai bes and contri fembrane pro-	ectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte l Considerations - Costing of APC Equipment – Case Quality Management of of indoor air pollutants, sick building syndrome typ	s - Process C obile sources n and performers – Process e studies for s bes – Radon I - Sources and	ontrol nance contro tation Polluti	and 11 He equat ol and ary an 11 He on and	oui ior id
Particulate Monitoring Unit IV Factors affo of absorption Monitoring mobile sound Unit V Sources type control – N	Scrubbers, F g – Costing o Control of ecting Select on, Adsorpti- g - Operation rces. Indoor Ai bes and contri fembrane pro-	lectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte l Considerations - Costing of APC Equipment – Case Quality Management ol of indoor air pollutants, sick building syndrome typ cess - UV photolysis – Internal Combustion Engines	s - Process C obile sources n and performers – Process e studies for s oes – Radon I - Sources and es.	ontrol nance contro tation Polluti 1 Effee	and 11 He equat ol and ary an 11 He on and cts of	our ion id our d it
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Particulate Monitoring Unit IV Factors affo of absorptio Monitoring mobile sou Unit V Sources typ control – N Noise Pollu	Scrubbers, F g – Costing o Control of ecting Select on, Adsorpti- g - Operation rces. Indoor Ai pes and contri fembrane pro- ution – Meas	lectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte l Considerations - Costing of APC Equipment – Case Quality Management of of indoor air pollutants, sick building syndrome typ cess - UV photolysis – Internal Combustion Engines irement – Standards –Control and Preventive measure	s - Process C obile sources n and performers – Process e studies for s oes – Radon I - Sources and es.	ontrol nance contro tation Polluti 1 Effee	and 11 He equat ol and ary an 11 He on and cts of	oun ior id oun d it
Particulate Monitoring Unit IV Factors affo of absorption Monitoring mobile sound Unit V Sources type control – N	Scrubbers, F g – Costing o Control of ecting Select on, Adsorpti- g - Operation rces. Indoor Ai bes and contri fembrane pro- ution – Meas ntcomes: After comp 7. Apply	lectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte l Considerations - Costing of APC Equipment – Case Quality Management ol of indoor air pollutants, sick building syndrome typ cess - UV photolysis – Internal Combustion Engines irement – Standards –Control and Preventive measure letion of the course, Student will be able to sampling techniques	s - Process C obile sources n and performers – Process e studies for s oes – Radon I - Sources and es.	ontrol nance contro tation Polluti 1 Effee	and 11 He equat ol and ary an 11 He on and cts of	oun ior id oun d it
Particulate Monitoring Unit IV Factors affo of absorptio Monitoring mobile sou Unit V Sources typ control – M Noise Pollu	Scrubbers, F <u>control of</u> <u>control of</u> ecting Select on, Adsorpting <u>control of</u> ecting Select on, Adsorpting <u>control of</u> <u>control o</u>	lectrostatic Precipitators – Operational Consideration APC equipment – Case studies for stationary and mo Gaseous Contaminants on of Control Equipment – Working principle, Desig n, condensation, Incineration, Bio scrubbers, Bio filte l Considerations - Costing of APC Equipment – Case Quality Management of of indoor air pollutants, sick building syndrome typ cess - UV photolysis – Internal Combustion Engines irement – Standards –Control and Preventive measure letion of the course, Student will be able to	s - Process C obile sources n and performers – Process e studies for s bes – Radon I - Sources and es. Total:	ontrol nance contro tation Polluti 1 Effec	and 11 He equat of and ary and 11 He on and cts of 45 He	ior id <u>ou</u> d it



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV203		NDUSTRIAL WASTE MANAGEME	ENT	L	Τ	P	C
				3	0	0	3
Course Ob							
	-	owledge on the concept and application	-	-		on,	
		ologies, industrial wastewater treatment	t and residue m	anagement	•		
Unit I	Introducti					8 He	
		a– Industrial activity and Environment -				ource	<mark>s</mark>
		stewater – Nature and Origin of Pollutar					
		Regulatory requirements for treatment of					
		wastewater monitoring and sampling -ge				ı and	
		ustrial effluents and Bioassay tests – Ma	ajor issues on v	vater qualit	<mark>у</mark>		
managemer	<mark>nt.</mark>						
Unit II	Induction	Mution Drovention & Weste Minimiz	ation			8 Ho	
		ollution Prevention & Waste Minimis Industrial Pollution – Benefits and Barr			t Llion		
		es – Periodic Waste Minimisation Asses					-
		t benefit analysis – Pay-back period – In					
		i concine analysis i ay cuch period in	inpremienting ca	, i ronno ung	, 1 0 11		
Prevention	Programs in	dustries.					
						10 He	ours
Unit III	Industrial	dustries. / <mark>astewater Treatment</mark> on – Solids Separation – Removal of Fa	ts, Oil & Greas	se- Neutrali		<b>10 H</b> o n –	ours
<b>Unit III</b> Flow and L	Industrial oad Equalization	astewater Treatment			izatio	n –	ours
Unit III Flow and L Removal of	Industrial oad Equalization Inorganic C	/ <mark>astewater Treatment</mark> on – Solids Separation – Removal of Fa 1stituents – Precipitation, Heavy metal re	emoval, Nitro	gen & Phos	izatio sphor	n – ous	ours
Unit III Flow and L Removal of removal, Io	Industrial oad Equaliza f Inorganic C n exchange,	Vastewater Treatment on – Solids Separation – Removal of Fa nstituents – Precipitation, Heavy metal r dsorption, Membrane Filtration, Eletrod	emoval , Nitro lialysis& Evapo	gen & Phos oration – R	izatio sphor emov	n – ous al of	Durs
Unit III Flow and L Removal of removal, Io Organic Co	Industrial oad Equaliza f Inorganic C on exchange, onstituents –	/ <mark>astewater Treatment</mark> on – Solids Separation – Removal of Fa 1stituents – Precipitation, Heavy metal re	emoval , Nitro lialysis& Evapo	gen & Phos oration – R	izatio sphor emov	n – ous al of	ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T	Vastewater Treatment on – Solids Separation – Removal of Fa astituents – Precipitation, Heavy metal re dsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical	emoval , Nitro lialysis& Evapo	gen & Phos oration – R	izatio sphor emov	n – ous al of	
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewato	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal re dsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical vatability Studies.	emoval , Nitro lialysis& Evapo Oxidation Proc	gen & Phos oration – R cesses, Adv	izatio sphor emov ance	n – ous al of d	
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a	Industrial oad Equaliza f Inorganic C on exchange, onstituents – processes – T Wastewate and Common	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical ratability Studies. Reuse and Residual Management	emoval , Nitro lialysis& Evapo Oxidation Pro- ent of industria	gen & Phos oration – R cesses, Adv	sphor emov ance	n – ous al of d <b>9 H</b> o	ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater	Industrial oad Equaliza f Inorganic C on exchange, onstituents – processes – T Wastewat and Common - Zero efflue	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical eatability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatmet	emoval , Nitro lialysis& Evapo Oxidation Pro- ent of industria nts for Wastew	gen & Phos oration – R cesses, Adv l and dome vater reuse -	sphor emov ance stic – Indu	n – ous al of d <b>9 H</b> a	Durs
Flow and L Removal of removal, Io Organic Co Oxidation p <b>Unit IV</b> Individual <i>a</i> wastewater reuse, Pres	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewato and Common - Zero efflue ent status an	Vastewater Treatment on – Solids Separation – Removal of Fa astituents – Precipitation, Heavy metal re dsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical atability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment t discharge systems - Quality requirement	emoval , Nitro lialysis& Evapo Oxidation Proc ent of industria nts for Wastew esiduals of indu	gen & Phos oration – R cesses, Adv l and dome vater reuse - ustrial wast	izatio sphor emov ance stic - Indu ewate	n – ous al of d <b>9 Ho</b> ustrial r	ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment –	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewato and Common - Zero effluo ent status an Quantificati	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical eatability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment t discharge systems - Quality requirement issues - Disposal on water and land – Re	emoval , Nitro lialysis& Evapo Oxidation Proc ent of industria nts for Wastew esiduals of indu	gen & Phos oration – R cesses, Adv l and dome vater reuse - ustrial wast	izatio sphor emov ance stic - Indu ewate	n – ous al of d <b>9 Ho</b> ustrial r	ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment – and disposa	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewato and Common - Zero effluo ent status an Quantificati	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical atability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment t discharge systems - Quality requirement issues - Disposal on water and land – Re and characteristics of Sludge – Thicker Management of RO rejects.	emoval , Nitro lialysis& Evapo Oxidation Proc ent of industria nts for Wastew esiduals of indu	gen & Phos oration – R cesses, Adv l and dome vater reuse - ustrial wast	izatio sphor emov /ance /ance / stic - Indu ewate ng, d	n – ous al of d <b>9 Ho</b> ustrial r	ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment – and disposa Unit V	Industrial oad Equaliza f Inorganic C on exchange, onstituents – processes – T Wastewate and Common - Zero efflue ent status an Quantificati il of sludge – Case Stud	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical atability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment t discharge systems - Quality requirement issues - Disposal on water and land – Re and characteristics of Sludge – Thicker Management of RO rejects.	emoval , Nitro lialysis& Evapo Oxidation Proc ent of industria nts for Wastew esiduals of indu ning, digestion	gen & Phos oration – R cesses, Adv l and dome vater reuse - ustrial wast , conditioni	izatio sphor emov /ance /stic - Indu ewate ng, d	n – ous al of d <b>9 Ho</b> ustrial or ewate <b>10 Ho</b>	ours ring
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment – and disposa Unit V Industrial n	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewate and Common - Zero efflue ent status an Quantificati al of sludge – Case Stud manufacturin	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical atability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment t discharge systems - Quality requirement issues - Disposal on water and land – Re and characteristics of Sludge – Thicker Management of RO rejects.	emoval , Nitro lialysis& Evapo Oxidation Prod ent of industria nts for Wastew esiduals of indu ning, digestion, eristics, source	gen & Phos oration – R cesses, Adv I and dome vater reuse - ustrial wast , conditioni reduction c	izatio sphor emov ance stic - Indu ewate ng, d	n – ous al of d <b>9 Ho</b> ustrial r ewate <b>10 Ho</b> s and	ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment – and disposa Unit V Industrial m waste treatm	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewate and Common - Zero efflue ent status an Quantificati al of sludge – Case Stud nanufacturin nent flow sh	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical eatability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment discharge systems - Quality requirement issues - Disposal on water and land – Re and characteristics of Sludge – Thicker Management of RO rejects.	emoval , Nitro lialysis& Evapo Oxidation Prod ent of industria nts for Wastew esiduals of indu ning, digestion, eristics, source	gen & Phos oration – R cesses, Adv I and dome vater reuse - ustrial wast , conditioni reduction c	izatio sphor emov ance stic - Indu ewate ng, d	n – ous al of d <b>9 Ho</b> ustrial r ewate <b>10 Ho</b> s and	ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment – and disposa Unit V Industrial m waste treatm	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewate and Common - Zero efflue ent status an Quantificati al of sludge – Case Stud nanufacturin nent flow sh	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical atability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment discharge systems - Quality requirement issues - Disposal on water and land – Re and characteristics of Sludge – Thicker Management of RO rejects.	emoval , Nitro lialysis& Evapo Oxidation Prod ent of industria nts for Wastew esiduals of indu ning, digestion, eristics, source	gen & Phos oration – R cesses, Adv I and dome vater reuse - ustrial wast , conditioni reduction c ishing – Oi	sphor emov ance stic - Indu ewate ng, d	n – ous al of d <b>9 H</b> ustrial r ewate <b>10 H</b> s and ning	ours ring ours
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Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment – and disposa Unit V Industrial m waste treatr Pharmaceut	Industrial oad Equaliza f Inorganic C n exchange, onstituents – processes – T Wastewate and Common - Zero efflue ent status an Quantificati al of sludge – Case Stud nanufacturin ment flow sh ticals – Suga tcomes: After comp 9. Define	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical atability Studies. Reuse and Residual Management Effluent Treatment Plants – Joint treatment t discharge systems - Quality requirement issues - Disposal on water and land – Ref and characteristics of Sludge – Thicker Management of RO rejects. Forocess description, wastewater character t for Textiles – Tanneries – Pulp and pand and Distilleries tion of the course, Student will be able to be Principles of pollution prevention and	emoval , Nitro lialysis& Evapo Oxidation Prod ent of industria nts for Wastew esiduals of indu ning, digestion, eristics, source per – metal fin	gen & Phos oration – R cesses, Adv I and dome vater reuse - ustrial wast , conditioni reduction c ishing – Oi <b>Total:</b>	izatio sphor emov ance stic - Indu ewate ng, d	n – ous al of d 9 Ho ustrial r ewate s and ning 45 Ho	ours ring ours
Unit III Flow and L Removal of removal, Io Organic Co Oxidation p Unit IV Individual a wastewater reuse, Pres treatment – and disposa Unit V Industrial m waste treatr Pharmaceut	Industrial oad Equaliza f Inorganic C in exchange, instituents – processes – T Wastewati and Common - Zero efflud ent status an Quantificati il of sludge – Case Stud nanufacturin ment flow sh ticals – Suga tcomes: After comp 9. Define 10. Sugges	Vastewater Treatment on – Solids Separation – Removal of Fanstituents – Precipitation, Heavy metal redsorption, Membrane Filtration, Eletrod ological treatment Processes, Chemical atability Studies. <b>Reuse and Residual Management</b> Effluent Treatment Plants – Joint treatment t discharge systems - Quality requirement issues - Disposal on water and land – Ref and characteristics of Sludge – Thicker Management of RO rejects. Solution Treatment Planter – Pulp and pagen and Distilleries t for Textiles – Tanneries – Pulp and pagen and Distilleries	emoval , Nitro lialysis& Evapo Oxidation Prod ent of industria nts for Wastew esiduals of indu ning, digestion, eristics, source per – metal fin	gen & Phos oration – R cesses, Adv I and dome vater reuse - ustrial wast , conditioni reduction c ishing – Oi <b>Total:</b>	izatio sphor emov ance stic - Indu ewate ng, d	n – ous al of d 9 Ho ustrial r ewate s and ning 45 Ho	ours ring ours
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV204		SOLID AND HAZARDOUS WASTE MANAGEMENT	L	T	Р	C
			3	0	0	3
<b>Course Ob</b>	jectives:					
	To impart	knowledge and skills in the collection, storage, transport, treati	nent,	dispo	osal a	ıd
	recycling o	options for solid wastes including the related engineering princi	iples,	desig	<u>g</u> n	
	criteria, me	ethods and equipment.				
Unit I	Sources, C	Classification and Regulatory Framework			9 H	ours
Types and	Sources of s	solid and hazardous wastes - Need for solid and hazardous w	aste n	nanag	gemer	it
Salient feat	tures of India	an legislations on management and handling of municipal soli	d was	stes, l	nazaro	lous
wastes, bic	medical was	stes, nuclear wastes - lead acid batteries, electronic wastes, p	lastics	s and	fly a	sh –
Elements of	of integrated	l waste management and roles of stakeholders - Financing	and	Publi	ic Pri	vate
Participatio	on for waste	management.				
Unit II		aracterization and Source Reduction			<u>8 Ho</u>	
		and variation - Composition, physical, chemical and biologica				
		haracteristics – TCLP tests – waste sampling and characteriz			- So	urce
		aste exchange - Extended producer responsibility - Recycling	and re			
Unit III		Collection and Transport Of Wastes	• 1		9 Hoi	
		tion of wastes at source $-$ storage and collection of munic				
		systems - Need for transfer and transport – Transfer station				
		ty, storage, labeling and handling of hazardous wastes – hazard	ous w	vaste	mani	ests
and transpo		ocessing Technologies			10 11.	
Unit IV		rocessing – material separation and processing technologies	,		10 Ho	
		technologies – methods and controls of Composting -				
-	-	y recovery – incineration – solidification and stabilization of				
		l wastes - Health considerations in the context of operation o	I Iaci	innes,	nanc	ling
	1	of outputs on the environment.		<u> </u>		
Unit V	Waste Dis				<u>9 Hor</u>	
		- Disposal in landfills - Landfill Classification, types and met				
		of sanitary landfills, secure landfills and landfill bioreactors –				
landfill ren		ndfill closure and environmental monitoring - Rehabilitation	1 01 0	open	aum	<u>)</u> S –
landini ren	legiation.					
		Tot	al:		45 H	ours
Course Ou						
		pletion of the course, Student will be able to				
		stand the characteristics of different types of solid and hazard	lous v	waste	s and	the
		affecting variation				
		e and explain important concepts in the field of solid wast				and
		st suitable technical solutions for treatment of municipal and in				
		stand the role legislation and policy drivers play in stakehold				
		and apply the basic scientific principles for solving practical	wast	e ma	nager	nent
	challer	nges				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

		ENVIRONMENTAL IMPACT ASSESSMENT	T	Р	C
		3	0	0	3
Course O					
	-	ose the students to the need, methodology, documentation and			
	environ	imental impact assessment and to develop the skill to prepare	envir	onme	ental
	manage	ement plan.			
	6. To pro	vide knowledge related to the broad field of environmental ri	sk as	sessm	nent,
	importa	ant processes that control contaminant transport and tools that	can b	e use	d in
	predicti	ing and managing human health risks.			
Unit I	Introductio			8 Ho	ours
Historical	development of	of Environmental Impact Assessment (EIA). EIA in Project Cycle.	Legal		
	-	dia. – Types and limitations of EIA –.EIA process- screening – sco	-		ng –
		oss sectoral issues and terms of reference in EIA – Public Participa			
		·			
Unit II		entification and Prediction		<u>10 Ho</u>	
		Checklists – Cost benefit analysis – Analysis of alternatives – Softw			
		s in EIA. Prediction tools for EIA – Mathematical modeling for im			tion
		s – air – water – soil – noise – biological — Cumulative Impact As	sessm		
Unit III		act Assessment and EIA Documentation		8 Ho	ours
	nact accecemen				
		t - Relationship between social impacts and change in community			
	al arrangemen	ts. Individual and family level impacts. Communities in transition	Docui	nenta	tion
of EIA fine	al arrangemen dings – planni		Docui	nenta	tion
of EIA fine preparation	al arrangemen dings – planni n.	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re	Docui		
of EIA find preparation <b>Unit IV</b>	al arrangemen dings – planni n. Environme	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan	Docur port	nenta	
of EIA fine preparation <b>Unit IV</b> Environme	al arrangemen dings – planni n. <b>Environme</b> ental Managen	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and	Docun port	7 Ho	ours
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat	al arrangemen dings – planni n. <b>Environme</b> ental Managen tion Plans – Pe	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po	Docun port	7 Ho	ours
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a	al arrangemen dings – planni n. <b>Environme</b> ental Managen tion Plans – Pe ind Quality asp	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po pects of Environmental Impact Assessment- Case Studies.	Docur port nd ost pro	<b>7 Ho</b> ject a	ours udit
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b>	al arrangemen dings – planni n. Environme ental Managen tion Plans – Pe and Quality asj Environme	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management	Docur port nd ost pro	7 Ho ject a 12 Ho	ours udit
of EIA fine preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme	al arrangemen dings – planni n. Environme ental Managen tion Plans – Po nd Quality asp Environme ental risk asses	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation	Docun port	7 Ho ject a 12 Ho xposu	ours udit
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer	al arrangemen dings – planni n. Environme ental Managen tion Plans – Pe and Quality asp Environme ental risk asses nt – Exposure	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Poperts of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I	Docun port nd ost pro	7 Ho ject a 12 Ho xposu	ours udit
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmen methods –	al arrangemen dings – planni n. Environme ental Managen tion Plans – Po and Quality asp Environme ental risk asses nt – Exposure Event tree and	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mode	Docun port nd ost pro pn – E FEMA eling	7 Ho ject a 12 Ho xposu	ours udit ours ire
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat	al arrangemen dings – planni n. Environme ental Managen tion Plans – Pe and Quality asj Environme ental risk asses nt – Exposure Event tree and nt- Risk Chara	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Poperts of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I	Docun port nd ost pro pn – E FEMA eling	7 Ho ject a 12 Ho xposu	ours udit ours
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat	al arrangemen dings – planni n. Environme ental Managen tion Plans – Po and Quality asp Environme ental risk asses nt – Exposure Event tree and	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Popects of Environmental Impact Assessment- Case Studies. Ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mod acterization Risk communication - Emergency Preparedness Plans	Docun port ad ost pro pn – E FEMA eling –Desi	7 Ho ject a 12 Ho xposu of gn of	ours udit ours are risk
of EIA fine preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat	al arrangemen dings – planni n. Environme ental Managen tion Plans – Po and Quality as Environme ental risk asses nt – Exposure Event tree and nt- Risk Chara ent programs.	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mode	Docun port ad ost pro pn – E FEMA eling –Desi	7 Ho ject a 12 Ho xposu	ours udit ours are risk
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat	al arrangemen dings – planni n. Environme ental Managen tion Plans – Pe and Quality asp Environme ental risk asses at – Exposure Event tree and nt- Risk Chara ent programs.	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Poperts of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mod acterization Risk communication - Emergency Preparedness Plans Total:	Docun port ad ost pro pn – E FEMA eling –Desi	7 Ho ject a 12 Ho xposu of gn of	ours udit ours are risk
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat manageme	al arrangemen dings – planni n. Environme ental Managen tion Plans – Po and Quality asp Environme ental risk asses nt – Exposure Event tree and nt- Risk Chara ent programs.	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re- ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po- pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mod acterization Risk communication - Emergency Preparedness Plans Interimental Risk Communication - Emergency Preparedness Plans	Docun port ad ost pro on – E FEMA eling –Desi	7 Ho ject a 12 Ho xposu of gn of 45 Ho	udit udit ours ure risk
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat manageme	al arrangemen dings – planni n. Environme ental Managen tion Plans – Po and Quality as Environme ental risk asses nt – Exposure Event tree and nt- Risk Chara ent programs.	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Popects of Environmental Impact Assessment- Case Studies. Ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mod acterization Risk communication - Emergency Preparedness Plans Ietion of the course, Student will be able to tand the necessity to study the impacts and risks that will be caused	Docun port ad ost pro on – E FEMA eling –Desi	7 Ho ject a 12 Ho xposu of gn of 45 Ho	udit udit ours risk
of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat manageme	al arrangemen dings – planni n. Environme ental Managen tion Plans – Pe and Quality asp Environme ental risk asses at – Exposure Event tree and nt- Risk Chara ent programs. Utcomes: After comp 5. Underst industri	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Poperts of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mod acterization Risk communication - Emergency Preparedness Plans Ietion of the course, Student will be able to tand the necessity to study the impacts and risks that will be caused ies and the methods to overcome these impacts.	Docur port nd ost pro Dn – E FEMA eling –Desi	7 Ho ject a 12 Ho xposu of gn of 45 Ho roject	ours udit ours risk ours ts or
of EIA fine preparation <b>Unit IV</b> Environme Rehabilitat – Ethical a <b>Unit V</b> Environme Assessmer methods – contaminat	al arrangemen dings – planni n. Environme ental Managen tion Plans – Pe and Quality asp Environme ental risk asses at – Exposure Event tree and nt- Risk Chara ent programs. Utcomes: After comp 5. Underst industri	ts. Individual and family level impacts. Communities in transition ng – organization of information and visual display materials – Re ental Management Plan nent Plan - preparation, implementation and review – Mitigation and olicy and guidelines for planning and monitoring programmes – Po- pects of Environmental Impact Assessment- Case Studies. Ental Risk Assessment and Management ssment framework-Hazard identification -Dose Response Evaluation Factors, Tools for Environmental Risk Assessment– HAZOP and I d fault tree analysis – Multimedia and multipathway exposure mod acterization Risk communication - Emergency Preparedness Plans Total: letion of the course, Student will be able to tand the necessity to study the impacts and risks that will be caused	Docur port nd ost pro Dn – E FEMA eling –Desi	7 Ho ject a 12 Ho xposu of gn of 45 Ho roject	ours udit ours risk ours



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		UNIT OPERATIONS AND PROCESSES	L	Т	Р	С
		LABORATORY				
			0	0	2	1
Course Ob						
		evelop the skill for conducting Treatability studies of water				ater
		ent by various Unit Operations and Processes using laboratory sc				
		evelop the skill for conducting Treatability studies of water				ater
		ent by various Unit Operations and Processes using laboratory sc	cale m	ode	els.	
List of Exp						
	ation and Fl					
	studies on se					
		n- Characteristics of Filter media				
24. Water s	<u> </u>					
<b>_</b>	tion studies/					
		Silt Density Index				
		led growth process (activated sludge process)- Sludge volume In	ldex			
		systems / kinetics (Demonstration)				
		on Processes – (Ozonation, Photocatalysis)				
30. Disinfe	ection for Dr.	inking water			47 TT	
					15 117	ours
			Tota		13 110	
Course Ou	itcomes.		Tota			
Course Ou			Tota			
Course Ou	After com	pletion of the course, Student will be able to	Tota			
Course Ou	After com 5. Condu	pletion of the course, Student will be able to act treatability studies for water and waste water treatment.	Tota			
	After com 5. Condu 6. Design	pletion of the course, Student will be able to	lota			
References	After com 5. Condu 6. Design	pletion of the course, Student will be able to act treatability studies for water and waste water treatment. In laboratory models for various unit operations and processes.		:		tion
<b>References</b> 9. Metcal	After com 5. Condu 6. Design s: f and Eddy.	pletion of the course, Student will be able to act treatability studies for water and waste water treatment. In laboratory models for various unit operations and processes.		:		tion
<b>References</b> 9. Metcal Tata M	After com 5. Condu 6. Design 5: f and Eddy. cGraw Hill	pletion of the course, Student will be able to net treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Reu Publishing Company Limited, New Delhi, 2003.	ise, T	:   hird	Edit	
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References 9. Metcal Tata M 10. Lee, C. New Y	After com 5. Condu 6. Design 5: 6 and Eddy. cGraw Hill .C. and Shun ork, 1999.	pletion of the course, Student will be able to net treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes. . Inc. "Wastewater Engineering, Treatment, Disposal and Reu Publishing Company Limited, New Delhi, 2003. n dar Lin. Handbook of Environmental Engineering Calculation	use, T	hird	Edit	Hill
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV001		AIR POLLUTION METEOROLOGY A	AND	]	L	Т	Р	С
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Course Ob	jectives:			I	-	-		_
		e the emerging concepts of climate modeli	ing and proje	cting fut	ure	clima	ate	
	-	erstand data analysis and application.						
Unit I		ic Pollution					9 H	ours
particles, en	mission inve	ype of pollutants, gaseous and particulate p tory, various sources of emissions, bio-ma ad Acid Deposition Industrial pollution.						
Unit II	<b>Meteorol</b>	<mark>y</mark>					9 H	ours
Air pollutio	on meteorolo	y: sources of air pollution, methods for air	r pollution m	easureme	ent a	and c	ontro	1,
		at contribute to air quality degradation, ba						
		ondary pollutant formation. Effect of air po		luman he	alth	, ma	terial	and
vegetation,	Deposition	f particulate pollutants in the respiratory sy	ystem.					
Unit III	<b>Transpor</b>	Models					9 H	nire
	ic chemical		sional atmosp	heric che	emi	cal tr	anspo	
Atmospher		ansport models, box models, three-dimens	-				-	
Atmospher models, cor	mponents of	ansport models, box models, three-dimens ir quality forecasting and modelling, evalu	uation and va	lidation,	air	quali	ty	
Atmospher models, con standards a	mponents of and index, lo	ansport models, box models, three-dimens ir quality forecasting and modelling, evalu g range transport of pollutants. Back trajec	uation and va	lidation,	air	quali	ty ions	ort
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Atmospher models, con standards a <b>Unit IV</b> Transport a concentrati modelling a <b>Unit V</b>	mponents of and index, lo <b>Dispersio</b> and dispersio ions from po and predictio <b>Software</b>	ansport models, box models, three-dimens ir quality forecasting and modelling, evalu g range transport of pollutants. Back trajec Models of air pollutants - wind velocity, wind spe t sources - the Gaussian Equation - atmosp - Plume rise, modelling techniques.	uation and va etory constructed and turbu	lidation, ction and	air app tim	quali olicat	ty ions 9 He	ort Durs
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

17EV002		CLIMATE CHANGE AND MODELING	L	T	Р	C
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Course Ob						
		ice the emerging concepts of climate modeling and projectin	g future	clima	ate	
		nderstand data analysis and application.				
Unit I		Change and Climate Variability			9 H	
		here - weather and Climate - climate parameters (Temperatur				
		governing the atmosphere - Numerical Weather Prediction N	Iodels -	Intro	duction	on
to GCMs -	Application	in Climate Change Projections.				
Unit II	IPCC SR	ES Scenarios			9 H	our
		el on Climate Change (IPCC) - An Overview - Key Assumpt	tions - S	cenar		
•		, B1, A2, B2).				
Unit III	Global Cl	imate MODEL (GCM) and Regional Climate Model (RC	<sup>C</sup> M)		9 H	our
Some typic	al GCMs (H	adCM3Q-UK Met Office) - Issues with GCMs - Introduction	n to RC	Ms a	nd LA	Ms
- some typi	cal RCMs li	ke PRECIS, Sim CLIM, MAGICC/SCENGENE - Advantag	es and l	Disad	vanta	ges
of GCMs a	nd RCMs.					0
<b>TT 0 TT 7</b>					0.11	
		ing Global Climate Model - An Overview		4 <b>1</b>	9 H	our
Need for do	ownscaling -	· Selection of GCMs for regional climate change studies - Er			у-	
Need for do Selection o	ownscaling - f - Ensemble	- Selection of GCMs for regional climate change studies - Er es, Model Domain (Spatial domain and temporal domain), R	esolutio	n and	y – l clim	ate
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV005		ENVIRONMENTAL POLICIES AND LEGISLATION	L	Т	P	С
			3	0	0	3
Course Ob	,,,,,,,					
	-	knowledge on the policies, legislations, institutional frame wor	k and	enfo	rcem	ent
TT •/ T		ns for environmental management in India.			0.11	
Unit I	Introducti		1.	.	9 H	ours
		nd Environmental Protection – National Environmental			-	
	• •	and Polluter Pays Principle – Concept of absolute liability – n nts and Protocols – Montreal Protocol, Kyoto agreement, Rio				
	0	on Act, Water (P&CP) Act, Air (P&CP) Act – Institutional	uccia		1-	
	SPCB/CPC					
Unit II		&CP) Act, 1974			8 He	
		egulatory agencies - responsibilities of Occupier Provision rela				
		Consent to establish, Consent to operate – Conditions of the co				-
-	• •	ures, State Water Laboratory – Appellate Authority – Penalties			on of	
consent con	iditions etc.	Provisions for closure/directions in apprehended pollution situ	lation	•		
Unit III	Air (P&C	P) Act, 1981			8 H	ours
Power & fu	inctions of re	egulatory agencies - responsibilities of Occupier Provision rela	ting to	o pre	ventic	n
and control	Scheme of	Consent to establish, Consent to operate - Conditions of the co	nsent	s - O	utlet -	-
Legal samp	ling procedu	ares, State Air Laboratory - Appellate Authority - Penalties f	or vio	latio	1 of	
consent con	ditions etc.	Provisions for closure/directions in apprehended pollution situ	ation			
Unit IV	<b>Environm</b>	ent (Protection) Act 1986			13 Ho	ours
Genesis of	the Act – de	legation of powers – Role of Central Government - EIA Notifi	cation	ı – Si	tting	of
Industries -	– Coastal Zo	ne Regulation - Responsibilities of local bodies mitigation	scher	ne et	c., for	
-		Management - Responsibilities of Pollution Control Boards u				
		occupier, authorization - Biomedical waste rules - responsibil	ities c	of ger	ierato	rs
and role of	Pollution Co	ontrol Boards				
Unit V	<b>Other Top</b>	nics			7 H	ours
		Indian Forest Act, Public Liability Insurance Act, CrPC, IPC -	Public	: Inte		
		ns - Supreme Court Judgments in Landmark cases.				
		Tot	al·		45 Ho	ours
Course Ou	tcomes:					
		bletion of the course, Student will be able to				
	-	the National environmental legislations and the policies				
		ogrammes to comply with the legal requirements related to or	ganiz	ation	s	
			-			



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17EV008	3	MEMBRANE TECHNOLO WASTE WATER		D L	T	P	C
		WASIE WAIEK	IKEAIWENI	3	0	0	3
Course (	Objectives:				Ū	v	
		the concept and principles of a	nembrane separation and	d its appli	cation	s in w	ater
		er treatment.				10.77	
Unit I		iltration Processes				<u>10 H</u>	
Flow filt porous, n	ration - Mem	stems- Theory of Membrane s ane Filtration- Flux and Pre- netric and asymmetric – Plate a abranes	ssure drop -Types and	choice o	f men	brane	
Unit II	Membran	Systems				10 H	ours
		and applications - Ultra fil	tration principles and a	applicatio	ns - l		
		oplications – Reverse Osmosis					ant
process of	control and ap	cations - Electro dialysis : Ie	on exchange membranes	s, process	desig	<b>n-</b>	
		embrane – Liquid Pertraction -					
		brane manufactures – Membra					stem
-	-	Iembrane systems - pump type	es and Pump selection– I	Plant oper	ations	-	
Economi	cs of Membrai	systems					
Unit III	Membran	Bioreactors				9 H	ours
Introduct	ion and Histor	l Perspective of MBRs, Biotre	atment Fundamentals, B	iomass S	eparat		
Principle	s, Fouling an	Fouling Control, MBR Desig	gn Principles, Design A	Assignmen	nt, Alt	ernati	ve
MBR Co	nfigurations, C	nmercial Technologies, Case S	Studies.				
Unit IV	Pretreatm	t Systems				8 H	ours
		trol of Fouling and Concentrat	ion Polarisation-Pretreat	ment met	hods a		
	-	Pretreatment – Langlier Index					
Biofoula	nt control.						
Unit V	Case Stud					8 H	ours
		of membrane-based water and	1 wastewater treatment s	vstems –	zero L		
		- Desalination of brackish wate		5		1	
	-					4	
Course	Dutcomes:			Total:		45 H	ours
		of the course, Student will be					
	1	with main membrane proc	esses principles separ	ration m	chani	sms	and
	applica	-	sees, principies, sepu				and
-		d the selection criteria for diff	erent membrane process	es			
		principle of the most common	_				
-		design of project for a particu			ion		
	o. Carry C	design of project for a particu	iai memorane teennolog	y applicat	1011.		



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		REMOTE SENSING AND GIS APPLICATIONS IN	L	Т	P	С
		ENVIRONMENTAL MANAGEMENT				
Course Ob			3	0	0	3
Course Ob		cate the students on aspects of Remote Sensing				
		op the different remote sensing technique				
		icate the students on aspects of GIS and data management				
		op the GIS Applications for monitoring and management of e	nviron	nent		
Unit I	Remote Se	nsing Elements			8 H	ours
		Principles of remote sensing, components of Remote Sensing	. Energ	v sou		
electromag	netic radiatio	on, Electromagnetic spectrum, Energy interaction, Spectra Energy recording technology.				
Unit II	Remote Se	ensing Technology			9 H	ours
	on of Remot	e Sensing Systems, Aerial photographs, Photographic system				
		Iultispectral remote sensing, Thermal remote sensing, Microv nsors, RADAR, LIDAR	vave re	mote	sensi	ng
Unit III	Social Imp	pact Assessment and EIA Documentation			9 H	ours
Social impa		nt - Relationship between social impacts and change in comn	nunity	and		
of EIA find preparation	lings – plann 1.	nts. Individual and family level impacts. Communities in tran ing – organization of information and visual display material		oort		
Unit IV		<mark>ental Management Plan</mark> ment Plan - preparation, implementation and review – Mitiga	tion or		10 H	ours
Rehabilitat	ion Plans – F	Policy and guidelines for planning and monitoring programme spects of Environmental Impact Assessment- Case Studies.			ject a	udit
Unit V	<b>Environm</b>	ental Risk Assessment and Management			9 H	ours
Assessmen methods –	t – Exposure Event tree ar nt- Risk Char	essment framework-Hazard identification -Dose Response Eve Factors, Tools for Environmental Risk Assessment– HAZO and fault tree analysis – Multimedia and multipath way exposu	P and F re mod	EMA eling	of	
managemen	in programmi	racterization Risk communication - Emergency Preparedness				
			otal:		45 He	ours
	itcomes:	To	otal:		45 H	ours
managemen	Itcomes: After com	Te bletion of the course, Student will be able to				
managemen	After comp 3. Unders	Deletion of the course, Student will be able to stand the necessity to study the impacts and risks that will be				
managemen	After comp 3. Unders industr	Te bletion of the course, Student will be able to	caused	l by p	rojec	ts or



BE

## E.G.S. PILLAY ENGINEERING COLLEGE (AUTONOMOUS)

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1701MGX001		PROFESSIONAL ETHICS	L	Т	P	C
			3	0	0	3
Course Objecti	Ves•					
course objecti		ary goal is to stimulate critical and responsible reflection or	n more	al issu	ies	
		g engineering practice and to provide the conceptual tools n				
	pursuing th	lose issues.		5		
		nake the students aware of the different ethical issues, codes	s of co	nduc	t for	
	engineers i	n the society and moralities in an organization.				
<mark>Unit I</mark>		JCTION & HUMAN VALUES			9 H	our
		Work Ethic - Team work – Types of Ethics - Respect for Ot				
		ge - Valuing Time - Co-operation - Commitment- Self-Cont	fidenc	e - Cı	ustom	IS
and religion-Car						
Unit II		RING ETHICS			9 H	
		of moral issues – Types of Inquiry – Professional accounta				
		rg's Theory – Gilligan's Theory – Theories about Right Act	10n –	Ethic	al co	les
of IEEE and Ins					10.11	
Unit III		& RESPONSIBILITY OF ENGINEERS	T 1		10 H	our
		ion – Safety and Risks – Risk – benefit analysis – Compute				
		gineering standards – Communicating Risk and Public Poli				
	ional Rights	and Employee Rights – Whistle Blowing – Collective Barg	gaining	g – Co	onflic	ts
of Interest.	ENGDIE				0.11	
Unit IV	ENGINE	R'SROLE				
	A 1		· 1			
		isors, Consultants, Experts and Witness - Engineers role in			nd soo	ciet
<ul> <li>Theories about</li> </ul>	t right action				nd soo	ciet
<ul> <li>Theories abou gas tragedy case</li> </ul>	t right action study.	risors, Consultants, Experts and Witness – Engineers role in – Moral leadership - Collegiality and loyalty – IPR – Disc			nd soo - Bho	ciet pal
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> </ul>	t right action study. GLOBAL	risors, Consultants, Experts and Witness – Engineers role in – Moral leadership - Collegiality and loyalty – IPR – Discr ISSUES	rimina	ition -	nd soo - Bho <b>8 H</b> o	ciet pal
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational comparison</li> </ul>	t right action study. GLOBAL orporations- <mark>1</mark>	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Discr ISSUES Environmental Ethics- Weapons Development- Code of Cor	rimina nduct -	tion - Eco	nd soo - Bho <b>8 H</b> o	ciet pal
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational co friendly product</li> </ul>	t right action study. GLOBAL prporations- ion system -	risors, Consultants, Experts and Witness – Engineers role in – Moral leadership - Collegiality and loyalty – IPR – Discr ISSUES	rimina nduct -	tion - Eco	nd soo - Bho <b>8 H</b> o	ciet pal
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational comparison</li> </ul>	t right action study. GLOBAL prporations- ion system -	risors, Consultants, Experts and Witness – Engineers role in – Moral leadership - Collegiality and loyalty – IPR – Disc <b>ISSUES</b> Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion	rimina nduct - – Eco	- Eco syste	nd soo - Bho 8 Ho  em	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational co friendly product</li> <li>Pollution contro</li> </ul>	t right action study. GLOBAL prporations- ion system - l.	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Discr ISSUES Environmental Ethics- Weapons Development- Code of Cor	rimina nduct - – Eco	- Eco syste	nd soo - Bho <b>8 H</b> o	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational co friendly product</li> </ul>	t right action study. GLOBAL orporations- ion system - l. ding:	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc <b>ISSUES</b> Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion <b>Tot</b>	rimina nduct - – Eco r <b>al:</b>	- Eco syste	nd soo - Bho 8 Ho  em	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational co friendly product</li> <li>Pollution contro</li> </ul>	t right action study. GLOBAL orporations- ion system - l. ding:	risors, Consultants, Experts and Witness – Engineers role in – Moral leadership - Collegiality and loyalty – IPR – Disc <b>ISSUES</b> Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion	rimina nduct - – Eco r <b>al:</b>	- Eco syste	nd soo - Bho 8 Ho  em	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational co friendly product</li> <li>Pollution contro</li> </ul>	t right action study. GLOBAL orporations- ion system - 1. ding: 4. An	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot nalysis about Safety and Risk Management in an Organisati	rimina nduct - – Eco r <b>al:</b>	- Eco syste	nd soo - Bho 8 Ho  em	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational cc friendly product</li> <li>Pollution contro</li> <li>Further Procee</li> </ul>	t right action study. GLOBAL orporations-I ion system - l. ding: 4. An 5. An	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc <b>ISSUES</b> Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion <b>Tot</b>	rimina nduct - – Eco r <b>al:</b>	- Eco syste	nd soo - Bho 8 Ho  em	ciet pal
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational co friendly product</li> <li>Pollution contro</li> </ul>	t right action study. GLOBAL orporations-I ion system - l. ding: 4. An 5. An nes:	risors, Consultants, Experts and Witness – Engineers role in A – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot halysis about Safety and Risk Management in an Organisati halysis about Code of Conduct for Ethical & Moral values	rimina nduct - – Eco r <b>al:</b>	- Eco syste	nd soo - Bho 8 Ho  em	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational cc friendly product</li> <li>Pollution contro</li> <li>Further Procee</li> </ul>	t right action study. GLOBAL orporations- ion system - l. ding: 4. An 5. An nes: After com	risors, Consultants, Experts and Witness – Engineers role in A – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot halysis about Safety and Risk Management in an Organisati halysis about Code of Conduct for Ethical & Moral values Deletion of the course, Student will be able to	nduct - – Eco al:	Eco - Eco syste	nd soo - Bho 8 Ho 	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational cc friendly product</li> <li>Pollution contro</li> <li>Further Procee</li> </ul>	t right action study. GLOBAL orporations- ion system - l. ding: 4. An 5. An nes: After comp 6. O	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot halysis about Safety and Risk Management in an Organisati halysis about Code of Conduct for Ethical & Moral values oletion of the course, Student will be able to otain awareness on Human Values & Social Values of the e	rimina nduct - – Eco on	- Eco syste	nd soo - Bho 8 Ho 	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational cc friendly product</li> <li>Pollution contro</li> <li>Further Procee</li> </ul>	t right action study. GLOBAL orporations- ion system - l. ding: 4. An 5. An nes: After comp 6. Ol 7. Ku	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot nalysis about Safety and Risk Management in an Organisati nalysis about Code of Conduct for Ethical & Moral values pletion of the course, Student will be able to otain awareness on Human Values & Social Values of the enowledge about ethical theories and relevant code of conduct	rimina nduct - – Eco al: on very in	- Eco syste	nd soo - Bho 8 Ho 	ciet pal our
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational cc friendly product</li> <li>Pollution contro</li> </ul> Further Proceed	t right action study. GLOBAL orporations-I ion system - l. ding: 4. An 5. An nes: After comp 6. Ol 7. Kn 8. En	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot halysis about Safety and Risk Management in an Organisati halysis about Code of Conduct for Ethical & Moral values pletion of the course, Student will be able to potain awareness on Human Values & Social Values of the environmental theories and relevant code of conduct numerate the safety and responsibility of engineers in the so	rimina nduct - – Eco al: on very in ct for o ciety.	- Eco syste	nd soo - Bho 8 Ho 	pal
- Theories abou gas tragedy case <b>Unit V</b> Multinational cc friendly product Pollution contro <b>Further Procee</b>	t right action study. GLOBAL orporations-I ion system - 1. ding: 4. An 5. An es: After comp 6. Ol 7. Kn 8. Er 9. Re	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot halysis about Safety and Risk Management in an Organisati halysis about Code of Conduct for Ethical & Moral values bletion of the course, Student will be able to otain awareness on Human Values & Social Values of the e howledge about ethical theories and relevant code of conduct numerate the safety and responsibility of engineers in the so calize their responsibilities, professional rights and moralitie	rimina nduct - – Eco al: on very in ct for o ciety.	- Eco syste	nd soo - Bho 8 Ho 	pal
- Theories abou gas tragedy case <b>Unit V</b> Multinational cc friendly product Pollution contro <b>Further Procee</b>	t right action study. GLOBAL orporations-I ion system - 1. ding: 4. An 5. An es: After comp 6. Ol 7. Kn 8. Er 9. Re	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot halysis about Safety and Risk Management in an Organisati halysis about Code of Conduct for Ethical & Moral values pletion of the course, Student will be able to potain awareness on Human Values & Social Values of the environmental theories and relevant code of conduct numerate the safety and responsibility of engineers in the so	rimina nduct - – Eco al: on very in ct for o ciety.	- Eco syste	nd soo - Bho 8 Ho 	pal
<ul> <li>Theories abou gas tragedy case</li> <li>Unit V</li> <li>Multinational cc friendly product</li> <li>Pollution contro</li> </ul> Further Proceed	t right action study. GLOBAL orporations-I ion system - l. ding: 4. An 5. An nes: After comp 6. Ol 7. Kn 8. En 9. Ro en	risors, Consultants, Experts and Witness – Engineers role in a – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES Environmental Ethics- Weapons Development- Code of Cor - Sustainable technology & development – ozone depletion Tot halysis about Safety and Risk Management in an Organisati halysis about Code of Conduct for Ethical & Moral values bletion of the course, Student will be able to otain awareness on Human Values & Social Values of the e howledge about ethical theories and relevant code of conduct numerate the safety and responsibility of engineers in the so calize their responsibilities, professional rights and moralitie	rimina nduct - – Eco cal: on very in ct for o ciety. ss for t	- Eco syste	nd soo - Bho 8 Ho 	pal



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1702CE305		BUILDING MATERIALS AND RESOURCE PLANNING	L	Т	Р	C
	-		3	0	0	3
Course Obje						
	1. To give s materials.	students an understanding of typical and potential application	on of	Buil	dıng	
		e that students know about the manufacturing process of Bu signing procedure of concrete	uildin	g ma	terial	3
	3.Give stud constructio	lents an appreciation of the effective use of common and m n	odern	n mat	erials	in
Unit I		ricks – concrete blocks 1 – Criteria for selection – Tests on stones – Deterioration			9 H	
stone work - Strength - V	- Bricks – C Vater Absorp	Plassification – Manufacturing of clay bricks – Tests on brotion – Efflorescence – Bricks for special use – Refractor eight concrete blocks.	icks -	- Co	mpres	ssive
Unit II	Lime – cen	nent – aggregates – mortar			9 H	ours
Soundness ar	nd consistenc Crushing st	Cement mortar – Hydration – Compressive strength – Tensile y – Setting time – Industrial byproducts – Fly ash – Aggreg trength – Impact strength – Flakiness Index – Elongatior nd Bulking.	ates –	- Nat	ural s	tone
Unit III	Concrete				9 H	ours
Strength Con Unit IV Timber – Ma Aluminum co Sealants for j	crete and HP Timber and rket forms – I omposite pan oints – Fiber	<ul> <li>apture – Tests – Mix specification – Mix proportioning – Displayed C – Self compacting Concrete – Other types of Concrete – Due d modern material</li> <li>Industrial timber– Plywood – Veneer – Therma Cole – Panels and – Uses – Paints – Varnishes – Distempers – Bitumens, glass reinforced plastic – Clay products – Refractories – Concranes and Geotextiles for earth reinforcement.</li> </ul>	of lar Glass	ty of 	Conce 9 Ho tes – S erami	rete. ours Steel cs –
Unit V	Materials r	nanagement			9 H	ours
	anagement -	Material Procurement and Delivery - Inventory Control - T				sts
Further Rea	ding:	100	ai.		<del>4</del> 5 III	Juis
	1. On con most co potenti	npletion of this course the students will be able to Compare ommon and advanced building materials and understand the al applications of these materials				of
Course Outc		letion of the course, Student will be able to				
	1	ze the most common and advanced materials used for constru-	ction.			
		ne manufacturing process of various building materials the properties of fresh and hardened concrete and performan	ice of	othe	r type	es of
	4. Illustrate	e the usage of timber, plywood and aluminum, composind modern materials.	ite m	ateria	ıl, pa	ints,



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	5.summariz	the procedure in material management						
1702CE604		WATER SUPPLY ENGINEERING			L	Т	Р	C
					3	0	0	3
Course Obje	ectives:							
		xamine the water supply system and con						
		preate an ability to evaluate the water the	reatment and a	advance	ed w	vater	treat	ment
		em.						
	3. To	rain the students to analyze water distribute	ution system ar	nd supp	ly to	) bui	ldings	5.
Unit I	<b>PLANNIN</b>	FOR WATER SUPPLY SYSTEM					08 H	ours
Public water	supply syste	-Planning -Design period - Population	forecasting -W	Vater de	emai	nd -S	Source	es of
		stics -Surface and Groundwater- Imp			Well	l hye	drauli	ics -
Development		of source - Water quality - Characterizat	ion and standar	rds.				
Unit II		NCE SYSTEM					07 H	
		tures -Functions and drawings -Pipes and						
•		-Transmission main design – Materials			-			ng of
pipes - Draw	ings appurter	nces - Types and capacity of pumps -Sele	ection of pump	os and p	ipe	mate	rials.	
Unit III	WATER 1	EATMENT					12 H	ours
Objectives -	Unit operati	as and processes - Principles, functions	s design and d	rawing	of	Scree	ens, I	Flash
mixers, flocc	ulators, sedir	entation tanks and sand filters - Disinfect	ion- Residue N	/anager	nent	t.		
		mation winds and saile meets Distinced		0				
Unit IV	ADVANC			8			09 H	ours
Unit IV Aerator - Iron		D WATER TREATMENT	alization -Wate				<b>09 H</b> salina	
Aerator - Iron	n and manga	D WATER TREATMENT se removal, Defluoridation and deminera		er softer	ning	- De	esalina	ation
Aerator - Iron	n and mangar Systems-Co	D WATER TREATMENT se removal, Defluoridation and deminera struction and Operation & Maintenanc		er softer	ning	- De	esalina	ation
Aerator - Iron - Membrane	n and mangar Systems-Co nces-Membra	D WATER TREATMENT se removal, Defluoridation and deminera struction and Operation & Maintenanc e processes.	ce aspects of	er softer	ning	- De	esalina nt Pla	ation ants-
Aerator - Iron - Membrane Recent advar Unit V	n and mangar Systems-Co nces-Membra	D WATER TREATMENT se removal, Defluoridation and deminera struction and Operation & Maintenanc processes. STRIBUTION AND SUPPLY TO BU	the aspects of <b>ILDINGS</b>	er softer Water	ning Trea	- De	esalina nt Pla <b>09 H</b>	ation ants- ours
Aerator - Iron - Membrane Recent advar Unit V Requirement	n and mangar Systems-Conces-Membra WATER I s of water d	D WATER TREATMENT se removal, Defluoridation and deminera struction and Operation & Maintenanc processes. STRIBUTION AND SUPPLY TO BUI tribution -Components -Service reserve	ce aspects of <b>ILDINGS</b>	er softer Water	ning Trea	- De atmen	esalina nt Pla <b>09 H</b> -Netv	ation ants- ours work
Aerator - Iron - Membrane Recent advar Unit V Requirement design - Ar	n and mangan Systems-Co nces-Membra WATER I s of water d nalysis of d	D WATER TREATMENT se removal, Defluoridation and deminera struction and Operation & Maintenanc processes. STRIBUTION AND SUPPLY TO BUT tribution -Components -Service reserve ribution networks –Pipe Appurtenanc	ce aspects of ILDINGS Dirs -Functions es -operation	er softer Water	ning Trea rawi	- De atmen	esalina nt Pla 09 H -Netwo	atior ants ours work Leak
Aerator - Iron - Membrane Recent advar Unit V Requirement design - Ar detection, M	n and mangar Systems-Conces-Membra WATER I s of water d nalysis of di ethods. Princ	D WATER TREATMENT se removal, Defluoridation and deminera struction and Operation & Maintenanc processes. STRIBUTION AND SUPPLY TO BUI tribution -Components -Service reserve	te aspects of <b>ILDINGS</b> Dirs -Functions tes -operation ngs -House ser	er softer Water	ning Trea rawi	- De atmen	esalina nt Pla 09 H -Netwo	ation ants- ours work Leak
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NAGAPATTINAM - 611 002. TAMILNADU, INDIA

1702CE652		ENVIRONMENTAL AND IRRIGATION DESIGN AND DRAWING	L	Т	Р	C
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<b>Course Obje</b>	ctives:					
	1.to know a	bout the design of environmental structures				
	2.to know t	he pictorial representation of irrigation structures				
Unit I		UPPLY AND TREATMENT			08 H	ours
Infiltration ga	llery – Intak	n mixer, flocculator, clarifier – Slow sand filter – Rapid sand f e towers – Service reservoirs – Pumping station – House serv ly and drainage.				
Unit II	<b>SEWAGE</b>	TREATMENT & DISPOSAL			07 H	ours
process - Aer	ation tank & dge drying b	reen chamber - Grit channel - Primary clarifier - Activated slu oxidation ditch – Trickling filters – Secondary clarifiers – Sl beds – Waste stabilisation ponds - Septic tanks and disposal				
Unit III		DING STRUCTURES			12 H	ours
		s Weir, Tank Sluice with tower road – Drawing showing plan luding foundation details.	,			
Unit IV	<mark>CANAL T</mark>	RANSMISSION STRUCTURES			09 H	ours
		educts – Super passage – Canal siphon – Canal Drops- Drawin nd foundation details.	ng			
Unit V		EGULATION STRUCTURES			09 H	ours
Canal head w detailed plan,		Regular – Canal escape- Proportional Distributors – Drawing d foundation.	showi	ng		
		Tot	al:		45 H	ours
<b>Further Rea</b>	ding:					
		e and draw advanced irrigation and environmental structures				
<b>Course Outc</b>						
		letion of the course, Student will be able to				
		vironmental treatment system				
		e irrigationimpounding structures				
	<u> </u>	e canal transmission structures				
References:	4. design tr	e canal regulation structures				
	"Environme	ntal Engineering", Vol.1 Khanna Publishers, New Delhi, 200				
2.Sathyanara	ana Murthy	"Irrigation Design and Drawing" Published by MrsL.Banuma		uni e	ast	
Godavari Dis 3.Sharma R.k 2002.		98 Engineering and Hydraulic Structures Oxford and IBH Publis	hing c	o., N	ew De	elhi
	"Water Supr	bly Engineering", Vol. I Standard Book House, New Delhi, 20	05.			
	C., Ashok K	Jain and Arun K Jain, "Water Supply Engineering", Laxmi P		tions	Pvt.	Ltd.,



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Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

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Course Ob	jectives:										1	
		derstand th										
		eate an abil					nt system					
	3. To ir	part the sig	nification	of dispos	sal of Sew	vage.						
Unit I		ING FOR									09 He	
Sources of - Factors a Legislation	ffecting C	aracteristic										
Unit II	DESIG	N OF SEW	<mark>/ER</mark>								09 He	ours
Sewerage -	Hydraulic	of flow in	sewers - I	Design pe	eriod - De	sign of sa	nitary and	storm se	wers	-Sn	nall bo	ore
systems - N												
maintenanc						ction of p	imps and j	pipe Drai	nage	Plu	ımbir	ıg
System for	Buildings -	One pipe a	ınd two pij	pe system	1.							
Unit III	PRIM	RY TREA	TMENT	OF SFW	ACF						09 He	nure
Objective –						ant prog	Deces Dri	mainlag 4				
drawing of	omi opei			Nelection	i of freafn				uncu			
	screen or	t chambers	and prime	Selection	1 of treatin	tanks –	Operation	and Mai	unct nten:	ions c	asneci	tano ts –
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Onsite sanit Unit IV Objective – Sludge Proc	tation - Sep SECON Selection cess and Tr	t chambers tic tank, Gr DARY TR of Treatmer ckling filte	and prima ey water h REATMEN nt Methods r, other tre	ary sedin arvesting NT OF S s – Princi eatment n	nentation g. <b>EWAGE</b> ples, Fun nethods –	tanks – ctions, D Oxidatio	Operation esign and in ditches,	and Mai	ntena of U Was	nits - te Sta	aspect 09 Ho Activ abiliza	ts – Durs Vated
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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1703CE006		SOLID WASTE MANAGEMENT	]	L	Т	Р	C
				3	0	0	3
Course Obje	ctives:		1				
	To study th	e Sources and types of municipal solid wastes					
	To impart t	he knowledge of On-site Processing, collection and tran	sfer of s	olic	l was	te.	
	To acquire	the knowledge of Off-site Processing and waste dispos	al mana	gen	nent.		
Unit I	SOURCES	AND TYPES OF MUNICIPAL SOLID WASTES				8 H	ours
methods of sa	impling and o iple of solid	wastes - Quantity – factors affecting generation of solid characterization- Effects of improper disposal of solid w waste management – social & economic aspects - Public	astes – p	ubl	ic he	alth	s —
Unit II	<b>ON-SITE S</b>	STORAGE & PROCESSING				8 H	ours
On-site storag		materials used for containers – on-site segregation of so	lid wast	es -	- publ	lic he	alth
& economic a	aspects of sto	rage – options under Indian conditions – Critical Evalua	tion of (	Dpti	ions.		
Unit III		TION AND TRANSFER					ours
		ypes of vehicles - Manpower requirement - collection				fer	
		ocation, operation & maintenance; options under Ind	ian cond	itio			
Unit IV		PROCESSING				12 He	
		Equipment; Resource recovery from solid wastes - con	nposting	, in	cinera	ation,	
		ndian conditions.					
Unit V	<b>DISPOSAI</b>					9 H	ours
		anitary landfills – site selection, design and operation of tion & treatment	sanıtary	T			
			Total:		4	15 He	ours
Further Rea	ding:						
	They can c	ategorize the types of wastes					
	They can cl	hoose the disposal units					
Course Outc							
		letion of the course, Student will be able to					
		e Sources and types of municipal solid wastes					
		e suitable method of Segregation of solid waste under Ir	ndian con	ndit	ion.		
		e methods of collectionand transfer of solid wastes					
		te the suitable Off-site Processing techniques					
	Choose the	various options for disposal of wastes and their selection	n criteri	a			
References:							
	-	id Waste Management, CPHEEO, Ministry of Urbar	n Develo	pm	ent,		
Government							
	and P.A.Re	ebers, Municipal Solid Wastes - problems and Solut	tions, Le	wis	Publ	isher	3,
1997.							



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		CDOUDE		NODE	DDC				L	Т	Р	C
1703CE009		GROUND	WATER E	NGINE	ERING			-	3	0	0	3
Course Obje	ctives:											
	1.To introdu	ice the stude	nt to the prin	nciples of	f Ground	lwater	goverr	ning Equ	atio	ns		
		eristicsofdif										
		risticsofdiffe										
		stand the tecl					ment c	of groun	lwat	er		
	4.To be intr	oduced to th	ne different t	theories of	of traffic	flow						
	5.To be awa	are of the im	portance of	traffic sa	ıfety							
Unit I		EOLOGIC.										ours
Introduction-Wa	ater bearing Prop	erties of Rock-	Type of aquife	rs - Aquifer	properties	-perme	ability, sj	pecific yie	d, tra	nsmissi	vity and	b
storage coefficier	t – Methods of	Estimation-Gr	ound water tabl	le fluctuatio	n and its ii	nterpretati	ions – C	iroundwat	r dev	elopm	ent and	
Potential in India-	-GEC norms.											
Unit II	WELLHY	<b>DRAULICS</b>	<mark>8</mark>								9H	ours
Objectiveso	fGroundwate	rhydraulics-	-Darcy'sLaw	v-Ground	lwatereq	uation-	-steady	ystate				
flow.Dupuit	Forchheimer	assumption-	Unsteadysta	teflow-T	heismet	hod-Ja	cobMe	thod-Sl	ıg	tes	ts	_
Imagewell t	heory –Partia	l penetration	nsof wells									
Unit III	<b>GROUND</b>	WATER M.	ANAGEME	ENT							9Н	ours
Need for Mar	nagement Mc	del – Datab	ase for grou	ndwater	manager	nent –	pround	water ba	lanc	e stuć	lv –	
Introduction	-		-		-	-					- )	
			•					a anno in g	,			
Unit IV		WATER QI										ours
Ground water											stheti	с
aspects of wa	ter quality - S	Saline intrus	ion – Enviro	onmental	concern	and R	egulato	ory requ	irem	ents		
Unit V	<b>GROUND</b>	WATER CO	<b>DNSERVAT</b>	ION							9 H	ours
Artificial recl	narge techniq	ues – Reme	diation of Sa	aline intr	usion– G	round	water	manager	nent	studi	es –	
Protection zo	ne delineatio	n, Contamin	ation source	e inventor	ry, reme	diation	schem	nes				
- Ground wat	er Pollution a	and legislation	on.									
								Tota	1.		45 H	oure
Further Rea	dinge							1014	1.		45 11	ours
Further Kea		l water to im	proving au	lity poro	matar							
		resource and										
Course Outc		resource and	rinydrology	Ior reatu	ies need	•						
Course Out		will be able	to understar	nd aquifa	r proper	tios on	d its da	momios	oftar	tha		
		of thecourse.										
	ofgroundwa		Ingivesation	posureio	waruswe	nuesig	manup	lactical	1001	CIIIS		
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	qualityconc		unuerständli	nemport	anceoidi	unual	recharg	geanugr	Juno	water		
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		gionalground		naaesign	waterwe	:115						
		vaterquality			1.							
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#### **ME ENVIRONMENTAL ENGINEERING**

17EV102		ENVIRONMENTAL CHEMISTRY	I		Т	Р	С
				3	0	0	3
Course Ob							
		cate the students about water chemistry					
		part knowledge in the area of air and soil chemistry					
	12. To im	part knowledge on the transformation of chemicals in	the enviro	onm	nent		
Unit I	<mark>Introducti</mark>					9 Ho	ours
		balance-Chemical equilibrium, acid base, solubility				avy	
metal precip	pitation, amp	hoteric hydroxides, CO2 solubility in water and spec	eies distrib	utic	on –		
Chemical k	inetics, First	order- 12 Principles of green chemistry.					
Unit II	<mark>Aquatic C</mark>					11 He	
Water quali	ty parameter	s- environmental significance and determination; Fat	te of chem	nica	ls in	aqua	tic
environmen	it, volatiliz	ation, partitioning, hydrolysis, photochemic	ical trans	forr	natio	on –	
		chemicals-Metals, complex formation, oxidation an					
diagrams, re	edox zones -	sorption- Colloids, electrical properties, double laye	r theory, e	envi	ronr	nenta	1
		coagulation.					
		ric Chemistry				7 He	
Atmospheri	c structure -	-chemical and photochemical reactions - photochem	ical smog	. Oz	zone	layer	
		gases and global warming, CO2 capture and sequestra	ation – Ac	id r	ain-	origi	n
1				Iu I	um	ongi	
and compos		culates. Air quality parameters-effects and determination		iu i	um	ongi	
Unit IV	Soil Chem	istry	ation.			9 Ho	ours
Unit IV Nature and	Soil Chem composition	stry of soil-Clays- cation exchange capacity-acid base an	ation. Id ion-exc	han	ge re	9 Ho eactio	ours
Unit IV Nature and in soil – Ag	Soil Chem composition ricultural ch	istry of soil-Clays- cation exchange capacity-acid base an emicals in soil-Reclamation of contaminated land; sa	ation. Id ion-exc	han	ge re	9 Ho eactio	ours
Unit IV Nature and in soil – Ag	Soil Chem composition ricultural ch	stry of soil-Clays- cation exchange capacity-acid base an	ation. Id ion-exc	han	ge re	9 Ho eactio	ours
Unit IV Nature and in soil – Ag metals by el Unit V	Soil Chem composition ricultural ch lectrokinetic Environm	stry of soil-Clays- cation exchange capacity-acid base an emicals in soil-Reclamation of contaminated land; sa remediation. ental Chemicals	ation. Id ion-excl It by leach	hang	ge re g-He	9 Ho eactio	ours ns
Unit IV Nature and in soil – Ag metals by el Unit V Heavy meta	Soil Chem composition ricultural ch lectrokinetic Environm ils-Chemical	istry of soil-Clays- cation exchange capacity-acid base an emicals in soil-Reclamation of contaminated land; sa remediation. ental Chemicals speciation –Speciation of Hg &As- Organic chemica	ation. Id ion-excl It by leach als- Pestic	hang	ge re g-He	9 Ho eactio avy 9 Ho	ours ns
Unit IV Nature and in soil – Ag metals by el Unit V Heavy meta Dioxins,PC	Soil Chem composition ricultural ch lectrokinetic Environm ils-Chemical Bs,PAHs an	istry of soil-Clays- cation exchange capacity-acid base an emicals in soil-Reclamation of contaminated land; sa remediation. ental Chemicals speciation –Speciation of Hg &As- Organic chemica d endocrine disruptors and their Toxicity- Nano mate	ation. Id ion-excl It by leach als- Pestic	hang	ge re g-He	9 Ho eactio avy 9 Ho	ours ns
Unit IV Nature and in soil – Ag metals by el Unit V Heavy meta Dioxins,PC	Soil Chem composition ricultural ch lectrokinetic Environm ils-Chemical Bs,PAHs an	istry of soil-Clays- cation exchange capacity-acid base an emicals in soil-Reclamation of contaminated land; sa remediation. ental Chemicals speciation –Speciation of Hg &As- Organic chemica	ation. Id ion-excl It by leach als- Pestic	hang	ge re g-He	9 Ho eactio avy 9 Ho	ours ns
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

17EV103		ENVIRONMENTAL MICROBIOLOGY	L	T	P	<u>C</u>
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Course Ob		·1 1 · 1 / 1· · · 1·1 1				4 1
		urse provides a basic understanding on microbiology relevan	nt to	envii	onme	ntal
		ring for candidates with little prior knowledge of the subject. orphology, behavior and biochemistry of bacteria, fungi, pro	tozo		110.00	and
		re outlined.	1020	a, vii	uses,	anu
	<u> </u>	crobiology of wastewater, sewage sludge and solid waste treat	atme	nt nr	ocesse	s is
	also pr	ovided. Aspects on nutrient removal and the transmission ms are also covered.				
		osure to toxicology due to industrial products and byproducts a	are a	lso.co	vere	1
		urse provides a basic understanding on microbiology relevan				
		ring for candidates with little prior knowledge of the subject.		•		
Unit I		on And Characteristics			5 Ho	ours
Classificatio	on of microo	ganisms – prokaryotic, eukaryotic, cell structure, characteristic	cs, P	reserv	vation	of
microorgan	isms, DNA, l	RNA, replication, Recombinant DNA technology.				
Unit II		and Nutrient Cycles			10 He	ours
		anisms – Distribution / diversity of Microorganisms – fresh an				
		surface soil, Air – outdoor and Indoor, aerosols, biosafety in La			-	
		archaebacteria – Significance in water supplies – problems and				
		Biogeochemical cyclesHydrological - Nitrogen, Carbon, Pl	hosp	horus	,	
		Micro Organism in nutrient cycle.			10 Ho	
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Unit III		1 of Microorganisms	id m			
Nutrition ar	nd metabolisr	n in microorganisms, growth phases, carbohydrate, protein, lip		etabo	lism	
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(Accredited by NAAC with 'A' Grade and NBA)

Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

20. The candidate has the ability to conduct and test the toxicity due to various natural and synthetic products in the environment.

#### **References:**

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- 23. Gabriel Bitton, Wastewater Microbiology, 2nd Edition,
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17EV104		TRANSPORT OF WATER AND WASTEWATER	L	Τ	P	С
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<b>Course Ob</b>	9					
		cate the students in detailed design concepts related to		missi	on ma	ains,
		listribution system, sewer networks and storm water drai	in			
<b>T</b> T <b>1</b> / <b>T</b>		cate the students in computer application on design.			0.11	
Unit I		ydraulics and Flow Measurement			8 He	
		ow – continuity principle, energy principle and moment essure flow, minor heads losses, Carrying Capacity–Flow			etiona	.1
Unit II	<mark>Water Tr</mark>	nsmission and Distribution			10 He	ours
networks D	esign, analy	inting, laying and maintenance, water hammer analysis; sis and optimization – appurtenances – corrosion prevent ction Storage reservoirs.				
Unit III	Wastewat				40.77	
Wastewater	ctors – Des r pumps and ce of sewers	er Collection and Conveyance gn of sanitary sewer; partial flow in sewers, economics o pumping stations- sewer appurtenances; material, constr Design of sewer outfalls-mixing conditions; conveyance	uction, insp	ign; bectio		ours
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV105		PRINCIPLES AND DESIGN OF PHYSICO-	L	Т	Р	С
		CHEMICAL TREATMENT SYSTEMS	•	-	0	-
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Course Ob	*	waste the students on the mineriales and message designs of	f	:	tusstu	
		ucate the students on the principles and process designs of	var	ious	treatr	nent
		ns for water and wastewater acate the students on design of treatment systems and the comp		nta a		
		ystems, leading to the selection of specific process.	pone	ms co	mpri	sing
Unit I	Introducti				5 Ho	11176
		wastewater – characteristics, Standards for performance - Sign	nifica	nce c		
		Selection criteria-types of reactors- reactor selection-batch-				
kinetics.		Selection enterna types of reactors reactor selection baten	001	ittiitu		ype
Unit II	Treatmen	t Principles			10 Ha	ours
		creening – Mixing, Equalization – Sedimentation – Filtratio	n –			
		sfer – mass transfer coefficient Adsorption – Isotherms – Me				
		o filtration, ultra-filtration and hyper filtration electro dial				
		zation - Recent Advances. Principles of Chemical treatm				
		ation – flotation solidification and stabilization – Disinfection				
		olvent extraction - advanced oxidation /reduction - Recent Tree				U
	e memous, s	orvent extraction – advanced oxidation /reduction – Recent field				
		Municipal Water Treatment Plants			10 Ha	ours
Unit III	<b>Design of</b>					
Unit III Selection o	Design of Treatment	Municipal Water Treatment Plants	chen	nical	feedi	ng -
Unit III Selection o Flocculatio	<b>Design of</b> of Treatment on – clarifier	Municipal Water Treatment Plants – Design of municipal water treatment plant units – Aerators –	chen press	nical sure f	feedi ilter,	ng - dua
Unit III Selection o Flocculatio media Disi	Design of of Treatment on – clarifier nfection - D	Municipal Water Treatment Plants <ul> <li>Design of municipal water treatment plant units – Aerators –</li> <li>tube settling – filters – Rapid sand filters, slow sand filter, plant settling – filters – Rapid sand filters, slow sand filter, plant settling – filters – Rapid sand filters, slow sand filter, plant settling – filters – Rapid sand filters, slow sand filters, plant settling – filters – Rapid sand filters, slow sand filters, plant settling – filters – Rapid sand filters, slow sand filters, plant settling – filters – Rapid sand filters, slow sand filters, plant settling – filters – Rapid sand filters, slow sand filters, plant settling – filters – Rapid sand filters, slow sand filters, plant settling – filters – Rapid sand sand filters, slow sand filters, plant settling – filters – Rapid sand sand filters, slow sand filters, plant settling – filters – Rapid sand sand filters, slow sand filters, plant settling – filters – Rapid sand sand filters, slow sand filters, plant settling – filters – filters – Rapid sand sand filters, slow sand filters, plant settling – filters – fi</li></ul>	chen press aulic	nical ure f	feedi ilter, ile, P	ng - dua ID
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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		in in the analysis of	chemical par	ameters of w	ater and waste w	vater			
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16. Good 03	Laborato	ry Practices,	Quality	control,	calibration	of	(	Glassy	<u>ware</u>
	ng and Anal	lysis of water (pH,	allalinity	ardnass ahl	orida Sulphota	turbi	lity		פתי
nitrate,	-	iysis of water (pri,	aikaininy, i	laruness em	oride, Surpliate,	turbi	any 1	fluoi	
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	vater analysi	s (BOD, COD, Pho	osphate, TK	V. Oil & Gi	rease. Surfactant	and	heav	v met	als).
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19. Sampli	ng and ana	alysis of air poll	utants Amb	vient & St	ack ( RSPM,	SO2	and	NO	x)
09	-								
20. Sampli	ng and	characterization	of soil	(CEC	& SAR,	pН	a	nd	<u>K).</u>
<mark>09</mark>						1			
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Course Ou	1		~						
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		et analysis on charac	eteristics of w	vater and was	ste water				
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, ,		ethods for the Exam	ination of W	ater and Wa	stewater, 21st Ed				
	ngton, 2005.		6		1.5. 11.11	1 77 .			
		for the Examination	of water, wa	astewater soi	I Rump, H.H. and	d Kris	t, H.		
20. Method		CH, Germany, 1992.	Irraia Iam	anDIadaa	Jr(Editor) 3rd	1 E.	1:4:	т	
	ers,Inc,USA	1 0	uysis, Jain	esr.Louge	Jr(Editor) 3rd	I EC	lition	, L	ewis
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Course Ob	jectives:								
		n in the analysis of p	physical para	meters of wa	ater and waste wa	ater			
	6. To train	n in the analysis of c	chemical para	ameters of w	ater and waste w	ater			
List of Exp	periments:								
29. Prepara	ation of cultu	re media							
30. Isolatic	on, culturing a	and Identification of	f Microorgan	<mark>isms</mark>					
31. Microo	rganisms fro	m polluted habitats	(soil, water a	nd air)					
32. Measur	ement of gro	owth of microorgani	sms, Assay c	f enzymes ir	nvolved in biotra	nsforn	natio	n	
_		rganic matter in was	ste water Ana	alysis of air b	oorne microorgar	nisms			
	g of bacteria								
35. Effect of	of pH, tempe	rature on microbial	<mark>growth</mark>						
		sing microbes from		luent.					
	-	on soil microorganis							
	<u> </u>	ysis of wastewater (							
	<u> </u>	ysis of wastewater (		treptococcus	s) - MF technique	es			
40. Effect of	of Heavy met	tals on microbial gro	owth						



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Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

41. Detection of Anaerobic bacteria (Clostridium sp.)		
42. Bioreactors		
	Total	45 Hours
	:	
Course Outcomes:		
After completion of the course, Student will be able to		
5. Field oriented testing of water, wastewater and solid waste for microl	oial conta	mination.
6. Perform toxicity test.		
References:		
7. Standard methods for the examination of water and wastewater, American Public	Health A	Association
(21st edition) 2005.		
8. Charles Gerba, Environmental Microbiology: A laboratory man	ual, Else	vier
Publications, 2012.		
9. Christon J. Hurst, Ronald L. Crawford, Jay L. Garland, David A. Lipson, Aaron	L. Mills,	and Linda
D. Stetzenbach, Manual of Environmental Microbiology, 3rd Edition, ASM Press,	2007.	



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	sewage treat								Sluc	daa	nra	2000	012	d w	riot	ion						our
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	nd suspendeo sposal – Nut																					
Unit IV	Sludge Tr										,				- )		p				5 H	
dewatering	sludge manag (mechanical sidue disposa	al an	nd gravi	ity) l	Layo	out, I																e
Unit V	Construct						Mai	inte	ena	nce	As	pect	ts								10 H	our
controlling	on and Opera of plant opera agement fac	erati	ions – c														ewa			ment		
Course Ou	itcomes:																-					
	After comp	plet	tion of	the c	cours	se, S	Stud	den	t wi	ill b	e ab	ole to	0									
	7. Develo	lop c	concept	tual s	scher	mati	tics	req	quir	ed f	or b	oiolc	ogic	cal t	reati	mer	nt o	f was	tew	ater		
	8. Transla	late	pertine	ent ci	riteri	ia in	nto s	sys	tem	n rec	quire	eme	nts									
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13. Arceiv 2000.	ala, S.J., Wa	Vaste	ewater	Trea	atme	ent f	for	Po	ollut	tion	Co	ontro	ol, '	ТМ	Н, 1	Nev	v D	elhi,	Se	econd	l Edi	tioı
Govern	l on "Sewe ment of Indi	dia, Ì	New D	elhi,	, 199	99.										-					-	
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Course Ob						
	-	knowledge on the principles and design of control of indoo	r/particul	late/g	aseou	s
	air polluta	nt and its emerging trends				
Unit I	Introduct				7 He	our
		ion of Atmosphere – Sources and classification of air pollut			of air	
1		alth, vegetation & animals, Materials & Structures –				
		phere, Soil & Water bodies – Long- term effects on the plan				
		Ambient Air Quality and Emission Standards – Air Polluti			Emissi	ion
Inventories	s – Ambient	and Stack Sampling and Analysis of Particulate and Gaseou	is Polluta	<mark>ints.</mark>		
Unit II	Air Dollut	ion Modelling			5 Ho	
		on Air Pollution - Fundamentals, Atmospheric stability, Inv	vorcion	Wind		
		is- Transport & Dispersion of Air Pollutants – Modeling Te				CS
	Climatology.	is- mansport & Dispersion of Mill Fondants – Modeling Te	ciniques	- 711		
Unit III		f Particulate Contaminants			11 He	111
		ion of Control Equipment – Gas Particle Interaction, – Wor	rking nrii			
						- 5
and berion	mance equal	ons of Gravity Separators (cyclone). Centrifugal separators	s Fabric 1	ilters	•	
		ons of Gravity Separators (cyclone), Centrifugal separators Electrostatic Precipitators – Operational Considerations - Pr				
Particulate	Scrubbers, I	Electrostatic Precipitators - Operational Considerations - Pr	ocess Co			
Particulate Monitoring	Scrubbers, I g – Costing o		ocess Co	ntrol		our
Particulate Monitoring <b>Unit IV</b>	Scrubbers, H g – Costing o Control o	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile	ocess Co sources.	ntrol	and	
Particulate Monitoring <b>Unit IV</b> Factors aff of absorpti	Scrubbers, I g – Costing o Control o ecting Select on, Adsorpti	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile a f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters –	ocess Co sources. l perform Process c	ntrol ance	and 11 Ho equat	ion
Particulate Monitoring <b>Unit IV</b> Factors aff of absorpti Monitoring	Scrubbers, I g – Costing of Control of ecting Select on, Adsorpti g - Operation	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and	ocess Co sources. l perform Process c	ntrol ance	and 11 Ho equat	ion
Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sou	Scrubbers, I g – Costing of <b>Control o</b> ecting Select on, Adsorpti g - Operation rrces.	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud	ocess Co sources. l perform Process c	ntrol ance contro ation	and 11 Ho equat ol and ary an	ion d
Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sou Unit V	Scrubbers, I g – Costing of <b>Control o</b> ecting Select on, Adsorpti g - Operation rcces.	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud r Quality Management	ocess Co sources. l perform Process c ies for st	ance ance contro ations	and 11 Ho equat l and ary an 11 Ho	ion d our
Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sou Unit V Sources typ	Scrubbers, I g – Costing of <b>Control o</b> ecting Select on, Adsorpti g - Operation rcces.	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud r Quality Management rol of indoor air pollutants, sick building syndrome types –	ocess Co sources. l perform Process c lies for st Radon Po	ntrol ance contro ations	and 11 He equat ol and ary an 11 He on and	ion d
Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sour Unit V Sources typ control – N	Scrubbers, I g – Costing of Control o ecting Select on, Adsorpti g - Operation rcces. Indoor Ai pes and contr Aembrane pr	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud r Quality Management rol of indoor air pollutants, sick building syndrome types – bccess - UV photolysis – Internal Combustion Engines - Sou	ocess Co sources. l perform Process c lies for st Radon Po	ntrol ance contro ations	and 11 He equat ol and ary an 11 He on and	ion d our
Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sou Unit V Sources typ control – N	Scrubbers, I g – Costing of Control o ecting Select on, Adsorpti g - Operation rcces. Indoor Ai pes and contr Aembrane pr	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud r Quality Management rol of indoor air pollutants, sick building syndrome types –	ocess Co sources. l perform Process c lies for st Radon Po	ntrol ance contro ations	and 11 He equat ol and ary an 11 He on and	ion d
Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sour Unit V Sources typ control – N	Scrubbers, I g – Costing of Control o ecting Select on, Adsorpti g - Operation rcces. Indoor Ai pes and contr Aembrane pr	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud r Quality Management rol of indoor air pollutants, sick building syndrome types – bocess - UV photolysis – Internal Combustion Engines - Sou urement – Standards –Control and Preventive measures.	ocess Co sources. l perform Process c lies for st Radon Po	ance contro ations	and 11 He equat ol and ary an 11 He on and	ion d our
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Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sour Unit V Sources typ control – N	Scrubbers, I g – Costing c ecting Select on, Adsorpti g - Operation rcces. Indoor Ai pes and contr dembrane pr ution – Meas Itcomes: After com 10. Apply	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud r Quality Management rol of indoor air pollutants, sick building syndrome types – bocess - UV photolysis – Internal Combustion Engines - Sou urement – Standards –Control and Preventive measures.	ocess Co sources. l perform Process of lies for st Radon Po urces and	ance contro ations	and 11 He equat ol and ary an 11 He on and ots of	ion d J it
Particulate Monitoring Unit IV Factors aff of absorpti Monitoring mobile sou Unit V Sources typ control – M Noise Pollu	Scrubbers, I g – Costing of Control o ecting Select on, Adsorpti g - Operation rrces. Indoor Ai pes and contr dembrane pr ution – Meas Itcomes: After com 10. Apply 11. Apply	Electrostatic Precipitators – Operational Considerations - Pr f APC equipment – Case studies for stationary and mobile f Gaseous Contaminants ion of Control Equipment – Working principle, Design and on, condensation, Incineration, Bio scrubbers, Bio filters – al Considerations - Costing of APC Equipment – Case stud r Quality Management rol of indoor air pollutants, sick building syndrome types – bocess - UV photolysis – Internal Combustion Engines - Sou urement – Standards –Control and Preventive measures.	ocess Co sources. I perform Process c ies for st Radon Pe Irces and <b>Total:</b>	ntrol ance contro ations ollution Effect	and 11 Ho equat of and ary an 11 Ho on ano cts of 45 Ho	d d i it



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV203	INDUSTRIAL WASTE MANAGEMENT	L	Т	Р	C
		3	0	0	3
<b>Course Ob</b>	J J				
	To impart knowledge on the concept and application of Industrial pollut	-		on,	
	cleaner technologies, industrial wastewater treatment and residue manag	ement			
Unit I	Introduction			8 He	ours
	cenario in India– Industrial activity and Environment - Uses of Water by i			ource	s
and types o	f industrial wastewater – Nature and Origin of Pollutants - Industrial wast	ewater	<sup>.</sup> and		
environmer	ntal impacts – Regulatory requirements for treatment of industrial wastewa	iter – l	ndust	trial	
waste surve	ey – Industrial wastewater monitoring and sampling -generation rates, char	acteri	zatior	<mark>ı and</mark>	
variables –	Toxicity of industrial effluents and Bioassay tests – Major issues on water	qualit	y		
managemei	<mark>it.</mark>				
Unit II	Industrial Pollution Prevention & Waste Minimisation			8 H	ours
	and Control of Industrial Pollution – Benefits and Barriers – Waste manage	remen	t Hier		
	action techniques – Periodic Waste Minimisation Assessments – Evaluation				
	Options – Cost benefit analysis – Pay-back period – Implementing & Prop				
	Programs in Industries.		, ,		
Unit III	Industrial Wastewater Treatment			10 H	ours
Flow and L	oad Equalization – Solids Separation – Removal of Fats, Oil & Grease- N	eutrali	zatio	n –	
Removal of	f Inorganic Constituents - Precipitation, Heavy metal removal, Nitrogen &	& Phos	sphor	ous	
removal, Io	n exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation	on – R	emov	al of	
Organic Co	nstituents - Biological treatment Processes, Chemical Oxidation Processe	s, Adv	ance	d	
Oxidation p	processes – Treatability Studies.				
Unit IV	Wastewater Reuse and Residual Management			9 H	ours
Individual a	and Common Effluent Treatment Plants – Joint treatment of industrial and	dome	stic		
wastewater	- Zero effluent discharge systems - Quality requirements for Wastewater	reuse -	- Indu	ustrial	
reuse, Pres	ent status and issues - Disposal on water and land - Residuals of industria	l wast	ewate	r	
treatment -	Quantification and characteristics of Sludge - Thickening, digestion, con	ditioni	ng, d	ewate	ring
	l of sludge – Management of RO rejects.		0,		C
Unit V	Case Studies			10 H	ours
Industrial n	nanufacturing process description, wastewater characteristics, source redu	ction c	ption	s and	
waste treati	nent flow sheet for Textiles - Tanneries - Pulp and paper - metal finishin	g – Oi	l Refi	ning	_
Pharmaceu	ticals – Sugar and Distilleries				
		tal:		45 Ho	
Course Ou				+ <u>5 П</u>	Jurs
Course Ou	After completion of the course, Student will be able to				
	13. Define the Principles of pollution prevention and mechanism of oxid	lation	proce	esses.	
	14. Suggest the suitable technologies for the treatment of wastewater.				
	15. Discuss about the wastewater characteristics				
	16. Design the treatment systems				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV204		SOLID AND HAZARDOUS WASTE MANAGEMENT	L	Т	P	C
			3	0	0	3
Course Ob	<b>v</b>					
		knowledge and skills in the collection, storage, transport, treat				ıd
	recycling of	pptions for solid wastes including the related engineering princ	iples,	desig	gn	
	criteria, me	ethods and equipment.				
Unit I		Classification and Regulatory Framework				ours
		solid and hazardous wastes - Need for solid and hazardous w				
		an legislations on management and handling of municipal soli				
		stes, nuclear wastes - lead acid batteries, electronic wastes, p				
Elements of	of integrated	waste management and roles of stakeholders - Financing	and	Publi	ic Pri	vate
Participatio	on for waste	management.				
II					0 11	
Unit II		aracterization and Source Reduction and variation - Composition, physical, chemical and biologica	1		8 Hou	
		naracteristics – TCLP tests – waste sampling and characterize				
		aste exchange - Extended producer responsibility - Recycling			- 30	urce
Unit III		Collection and Transport Of Wastes			9 Hoi	irs
•		ion of wastes at source – storage and collection of munic	inal			
		systems - Need for transfer and transport – Transfer station				
		y, storage, labeling and handling of hazardous wastes – hazard				
and transpo	-					
Unit IV	Waste Pro	ocessing Technologies			10 Ho	ours
Objectives	of waste p	rocessing - material separation and processing technologie	es —	biolo	gical	and
chemical	conversion	technologies - methods and controls of Composting -	therm	al c	onver	sion
technologie	es and energ	y recovery - incineration - solidification and stabilization of	` haza	rdous	s was	ies -
treatment of	of biomedica	l wastes - Health considerations in the context of operation o	f faci	lities,	hand	ling
of material	s and impact	of outputs on the environment.				_
Unit V	Waste Dis	posal			9 Hoi	irs
		- Disposal in landfills - Landfill Classification, types and met				
		of sanitary landfills, secure landfills and landfill bioreactors -				
		dfill closure and environmental monitoring - Rehabilitation	n of o	open	dum	<u>os</u> –
landfill ren	nediation.					
		Tot	al:		45 H	ours
Course Ou	itcomes:					
	After com	pletion of the course, Student will be able to				
		stand the characteristics of different types of solid and hazar	dous v	waste	s and	the
		affecting variation				
	11. Define	and explain important concepts in the field of solid was	te ma	nage	ment	and
		t suitable technical solutions for treatment of municipal and in				
		stand the role legislation and policy drivers play in stakehold				
		and apply the basic scientific principles for solving practical	wast	e ma	nager	nent
	challer	nges				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

17EV205			L	Т	Р	С
			3	0	0	3
Course O			- 1	0	1	
		pose the students to the need, methodology, documentation a				
		nmental impact assessment and to develop the skill to prepa	are e	envir	onme	nta
		gement plan.				
	8. To pro	ovide knowledge related to the broad field of environmental	risk	c ass	sessm	ent
	import	tant processes that control contaminant transport and tools that	at ca	n be	used	1 iı
	predic	ting and managing human health risks.				
Unit I	Introduct	ion			8 Ho	ur
Historical	development	t of Environmental Impact Assessment (EIA). EIA in Project Cyc	le. L	egal	and	
Regulatory	y aspects in I	ndia. – Types and limitations of EIA –.EIA process- screening – s	scopi	ing -	settir	ng -
analysis – <sup>-</sup>	mitigation. C	Cross sectoral issues and terms of reference in EIA – Public Partic	cipati	ion iı	n EIA	
Unit II	T	hand Canadian and David Africa		1	0 Ha	
		l <mark>entification and Prediction</mark> Checklists –Cost benefit analysis – Analysis of alternatives – Sof	G			
		Checkfists – Cost benefit analysis – Analysis of alternatives – Sol				
	Export system		imn	not n	radia	
		ns in EIA. Prediction tools for EIA – Mathematical modeling for				
- Assessm	nent of impact	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact 4			ent.	tior
– Assessm Unit III	nent of impaction of impaction of impaction of the second se	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation	Asse	ssme		tion
– Assessm Unit III Social imp	nent of impact Social Impoact assessme	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi	Asse ity ar	nd	ent. 8 Ho	ours
– Assessm Unit III Social imp institutiona	nent of impact Social Imp pact assessme al arrangement	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition	Asse ity ar	nd ocun	ent. 8 Ho	tior our:
– Assessm Unit III Social imp institutiona of EIA find	tent of impact Social Import oact assessme al arrangemen dings – plant	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi	Asse ity ar	nd ocun	ent. 8 Ho	tior our:
– Assessm Unit III Social imp institutiona	ent of impact Social Import oact assessme al arrangemen dings – plann n.	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ning – organization of information and visual display materials – I	Asse ity ar	nd ocun	ent. 8 Ho nenta	urs tior
- Assessm Unit III Social imp institutiona of EIA find preparation Unit IV	ent of impact Social Imp pact assessme al arrangemendings – plann n. Environm	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ning – organization of information and visual display materials – I mental Management Plan	Asse ity ar on D Repo	nd ocun	ent. 8 Ho	u <b>r</b>
- Assessm Unit III Social imp institutiona of EIA find preparation Unit IV Environme	ent of impact Social Imp pact assessme al arrangemendings – plann n. Environm ental Manage	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ning – organization of information and visual display materials – I	Asse ity ar on D Repo	nd ocum ort	ent. <b>8 Ho</b> nenta <b>7 Ho</b>	tion tion
- Assessm Unit III Social imp institutiona of EIA find preparation Unit IV Environme Rehabilitat	ent of impact Social Import pact assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ning – organization of information and visual display materials – I nental Management Plan ement Plan - preparation, implementation and review – Mitigation	Asse ity ar on D Repo	nd ocum ort	ent. <b>8 Ho</b> nenta <b>7 Ho</b>	tion tion
- Assessm Unit III Social imp institutiona of EIA find preparation Unit IV Environme Rehabilitat	ent of impact Social Import act assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I and Quality as	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ning – organization of information and visual display materials – I mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes –	Asse ity ar on D Repo	nd ocum ort l t proj	ent. <b>8 Ho</b> nenta <b>7 Ho</b>	tior tior tior
<ul> <li>Assessm</li> <li>Unit III</li> <li>Social imp institutiona of EIA fine preparation</li> <li>Unit IV</li> <li>Environme Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> </ul>	ent of impact Social Import act assessme al arrangement dings – plant n. Environm ental Manage tion Plans – I and Quality as Environm ental risk asse	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ning – organization of information and visual display materials – I mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes – spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management essment framework-Hazard identification -Dose Response Evalua	Asse ity ar on D Repo n and Post	sssme ocum ort l t proj	ent. 8 Ho nenta 7 Ho ject a 2 Ho xposu	tior tior tior udi
<ul> <li>Assessm</li> <li>Unit III</li> <li>Social implication</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> <li>Assessment</li> </ul>	ent of impact Social Import pact assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I and Quality as Environm ental risk asse nt – Exposure	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ing – organization of information and visual display materials – I nental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes – spects of Environmental Impact Assessment- Case Studies. nental Risk Assessment and Management essment framework-Hazard identification -Dose Response Evalua e Factors, Tools for Environmental Risk Assessment– HAZOP an	Asse ity ar on D Repo n and Post ation	essme ocum ort l t proj l 1 – Ez EMA	ent. 8 Ho nenta 7 Ho ject a 2 Ho xposu	tion tion udi
<ul> <li>Assessm</li> <li>Unit III</li> <li>Social implication</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> <li>Assessmer</li> <li>methods –</li> </ul>	ent of impact Social Import act assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I and Quality as Environm ental risk asse nt – Exposure Event tree an	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ing – organization of information and visual display materials – I mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes – spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management essment framework-Hazard identification -Dose Response Evalua e Factors, Tools for Environmental Risk Assessment– HAZOP an nd fault tree analysis – Multimedia and multipathway exposure m	Asse ity an on D Repo n and Post ation ad FE	ssme ocun ort t proj 1 - Ez EMA ling o	ent. 8 Ho nenta 7 Ho ject a 2 Ho xposu	tior tior tior udi udi
<ul> <li>Assessm</li> <li>Unit III</li> <li>Social implication</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> <li>Assessmer</li> <li>methods –</li> <li>contamination</li> </ul>	ent of impact Social Import act assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I and Quality as Environm ental risk asse nt – Exposure Event tree an int- Risk Char	ns in EIA. Prediction tools for EIA – Mathematical modeling for ts – air – water – soil – noise – biological — Cumulative Impact A pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communi nts. Individual and family level impacts. Communities in transition ing – organization of information and visual display materials – I nental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes – spects of Environmental Impact Assessment- Case Studies. nental Risk Assessment and Management essment framework-Hazard identification -Dose Response Evalua e Factors, Tools for Environmental Risk Assessment– HAZOP an nd fault tree analysis – Multimedia and multipathway exposure m racterization Risk communication - Emergency Preparedness Plar	Asse ity an on D Repo n and Post ation ad FE	ssme ocun ort t proj 1 1 – Ez EMA ling o	ent. 8 Ho nenta 7 Ho ject a 2 Ho xposu	tior <b>our</b> tior udi our re
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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				cting Treatability					vater
				ns and Processes					
				cting Treatability					vate
		ient by various	Unit Operatio	ns and Processes	using laborator	y scale	mod	els.	
List of Exp									
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<u>52. Baten</u> 10		3	lucies		on			Set	unns
33. Studies	s on	Filtra	tion- (	Characteristics	of	Filter		m	edia
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34. Water								softe	ning
7									
35. Adsorp	tion					S	tudie	s/Kin	etics
<mark>7</mark>									
36. Reverse	e	Osmosis	š-	Silt	Density			Iı	ndez
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14 38. Anaero		Reactor	arrat arra	/	kinetics	(T	<b>)</b>		
10		Reactor	systems	/	KINCLICS	(I	Jenio	nstra	uon
39. Advanc	red	Oxidation	Processes		(Ozonation,	1	Photo	catal	vsis
<u>14</u>		Oxidation	110003503		(Ozonation,		nou	catal.	y 515
40. Disinfe	ction		for	D	rinking			W	vate
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV001		AIR POLLUTION METEOROLOGY AND MODELING	L	Τ	Р	C
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Course Ob						
		ce the emerging concepts of climate modeling and proje	cting futur	e clim	ate	
<b>T</b> T •/ <b>T</b>	_	derstand data analysis and application.			0.11	
Unit I	1	ric Pollution	6.4	1.	9 H	ours
particles, e	mission inve	type of pollutants, gaseous and particulate pollutants, sintory, various sources of emissions, bio-mass burning, p nd Acid Deposition Industrial pollution.				
Unit II	<b>Meteorolo</b>	gy			9 H	ours
meteorolog how it cont	gical factors t tributes to se	gy: sources of air pollution, methods for air pollution m hat contribute to air quality degradation, basic chemistry condary pollutant formation. Effect of air pollution on H of particulate pollutants in the respiratory system.	y of the atm	nosphe	ere an	d
Unit III	<b>Transport</b>	Models			9 H	ours
models, co	mponents of	ransport models, box models, three-dimensional atmosp air quality forecasting and modelling, evaluation and va ag range transport of pollutants. Back trajectory construct	lidation, ai	r qual	ity	ort
models, co standards a <u>Unit IV</u> Transport a concentrati	mponents of and index, lor <b>Dispersior</b> and dispersio ions from poi	air quality forecasting and modelling, evaluation and va ag range transport of pollutants. Back trajectory construct Models n of air pollutants - wind velocity, wind speed and turbu nt sources - the Gaussian Equation - atmospheric stabili	lidation, ai ction and ap llence; estin	r qual pplicat nating	ity tions <u>9 H</u> e g	
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

17EV002		CLIMATE CHANGE AND MODELING	L	T	P	C
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Course Ob						
		ice the emerging concepts of climate modeling and projectin	ig future	clima	ate	
		nderstand data analysis and application.				
Unit I		Change and Climate Variability			9 H	
		here - weather and Climate - climate parameters (Temperatu				
Wind etc) -	- Equations	governing the atmosphere - Numerical Weather Prediction N	Models -	Intro	ducti	on
to GCMs -	Application	in Climate Change Projections.				
Unit II	IPCC SR	ES Scenarios			9 H	our
		el on Climate Change (IPCC) - An Overview - Key Assump	tions - S	cenar		Jui
-		, B1, A2, B2).				
Unit III	<b>Global C</b>	imate MODEL (GCM) and Regional Climate Model (RC	CM		9 H	our
0 111			<b>,</b>		/ 11	
Some typic	al GCMs (I	adCM3Q-UK Met Office) - Issues with GCMs - Introduction	on to RC	Ms a	nd LA	M
• •		ike PRECIS, Sim CLIM, MAGICC/SCENGENE - Advantag				
v 1						0
of GCMs a	nd RCMs.					
Unit IV	<b>Downsca</b>	ing Global Climate Model - An Overview			9 H	our
	<b>Downscal</b> ownscaling	- Selection of GCMs for regional climate change studies - En			у-	
Unit IV Need for de	<b>Downscal</b> ownscaling				у-	
Unit IV Need for do Selection o	<b>Downscal</b> ownscaling f - Ensembl	- Selection of GCMs for regional climate change studies - En	Resolutio	n and	y – l clim	ate
Unit IV Need for de Selection o variables -	<b>Downscal</b> ownscaling f - Ensembl	- Selection of GCMs for regional climate change studies - En es, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I	Resolutio	n and	y – l clim	ate
Unit IV Need for de Selection o variables - from each a	<b>Downscal</b> ownscaling of - Ensembl Lateral bour and their lin	- Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.	Resolutio	n and	ry – l clim examj	ate ples
Unit IV Need for do Selection o variables - from each a Unit V	<b>Downscal</b> ownscaling f - Ensembl Lateral bour and their lin <b>Analysis</b>	- Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations. Post Processing	Resolutio Dynamic	on and al) - e	y – l clim examp <b>9 H</b> e	ate ples
Unit IV Need for do Selection o variables - from each a Unit V a. Model va	<b>Downscal</b> ownscaling f - Ensembl Lateral bour and their lin <b>Analysis</b>	- Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.	Resolutio Dynamic	on and al) - e	y – l clim examp <b>9 H</b> e	ate ples
Unit IV Need for do Selection o variables - from each a Unit V a. Model va ArcGIS	<b>Downscal</b> ownscaling of - Ensembl Lateral bour and their lin <b>Analysis</b> alidation - p	- Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations. Post Processing	Resolutio Dynamic	on and al) - e	y – l clim examp <b>9 H</b> e	ate ples
Unit IV Need for do Selection o variables - from each a Unit V a. Model va ArcGIS	<b>Downscal</b> ownscaling of - Ensembl Lateral bour and their lin <b>Analysis</b> alidation - p	<ul> <li>Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and Initations.</li> <li>Post Processing         <ul> <li>Introduction to Analysis tools - Ferret, R, G act - Vulnerability assessment – adaptation strategies.</li> </ul> </li> </ul>	Resolutio Dynamic	on and al) - o L, SP	y – l clim examp <b>9 H</b> e	ate ples
Unit IV Need for de Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate	<b>Downscal</b> ownscaling of - Ensembl Lateral bour and their lin <b>Analysis</b> alidation - p change Imp	<ul> <li>Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and Initations.</li> <li>Post Processing         <ul> <li>Introduction to Analysis tools - Ferret, R, G act - Vulnerability assessment – adaptation strategies.</li> </ul> </li> </ul>	Cesolutio Dynamic Grads, ID	on and al) - o L, SP	y – l clim examj <u>9 He</u> PSS,	ate ples
Unit IV Need for de Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate	<b>Downscal</b> ownscaling of - Ensembl Lateral bour and their lin <b>Analysis</b> alidation - p change Imp	<ul> <li>Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and Initations.</li> <li>Post Processing         <ul> <li>Introduction to Analysis tools - Ferret, R, G act - Vulnerability assessment – adaptation strategies.</li> </ul> </li> </ul>	Cesolutio Dynamic Grads, ID	on and al) - o L, SP	y – l clim examj <u>9 He</u> PSS,	ate ples
Unit IV Need for do Selection o variables - from each a Unit V a. Model va ArcGIS	<b>Downscal</b> ing ownscaling of - Ensembl Lateral bour and their lin <b>Analysis</b> alidation - p change Imp ttcomes: After com	Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.     Post Processing     ost processing – Introduction to Analysis tools - Ferret, R, G     act - Vulnerability assessment – adaptation strategies.	Cesolutio Dynamic Grads, ID	on and al) - o L, SP	y – l clim examj <u>9 He</u> PSS,	ate oles our
Unit IV Need for de Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate	Downscaling ownscaling of - Ensembl Lateral bour and their lin Analysis alidation - p change Imp tcomes: After com 1.Know th	Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.      Post Processing     ost processing – Introduction to Analysis tools - Ferret, R, G act - Vulnerability assessment – adaptation strategies.      T     pletion of the course, Student will be able to	Cotal:	on and al) - o	y – l clim examj <u>9 He</u> PSS,	ate ples
Unit IV Need for de Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate Course Ou	Downscaling ownscaling of - Ensembl Lateral bour and their lin Analysis alidation - p change Imp tcomes: After com 1.Know th 2.Know th	Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.      Post Processing     ost processing – Introduction to Analysis tools - Ferret, R, G     act - Vulnerability assessment – adaptation strategies. <ul> <li>Image: The pletion of the course, Student will be able to the causes of climate change</li> </ul>	Cotal:	on and al) - o	y – l clim examj <u>9 He</u> PSS,	ate oles our
Unit IV Need for de Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate Course Ou References	Downscaling ownscaling of - Ensembl Lateral bour and their lin Analysis alidation - p change Imp tcomes: After com 1.Know th 2.Know th s:	Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.      Post Processing     ost processing – Introduction to Analysis tools - Ferret, R, G     act - Vulnerability assessment – adaptation strategies. <ul> <li>Image: The pletion of the course, Student will be able to the causes of climate change</li> </ul>	Cotal:	on and al) - o	y – l clim examj <u>9 He</u> PSS,	ate ples
Unit IV Need for de Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate Course Ou References 9. IPCC F	Downscaling ownscaling of - Ensembl Lateral bour and their lin Analysis alidation - p change Imp tcomes: After com 1.Know th 2.Know th s: Fourth Asses	Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.      Post Processing     ost processing – Introduction to Analysis tools - Ferret, R, G     act - Vulnerability assessment – adaptation strategies.      Introduction of the course, Student will be able to     ne causes of climate change	Cotal:	on and al) - o L, SP	y – l clim examp 9 Ho PSS, 45 Ho	our
Unit IV Need for do Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate Course Ou References 9. IPCC F 10. McGuf	Downscaling ownscaling of - Ensembl Lateral bour and their lin Analysis J alidation - p change Imp ttcomes: After com 1.Know th 2.Know th S: Fourth Assee ffie, K. and	- Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.  Post Processing ost processing – Introduction to Analysis tools - Ferret, R, G act - Vulnerability assessment – adaptation strategies.  pletion of the course, Student will be able to ne causes of climate change ne effects of climate change on various environments and various environments environment	Cotal:	on and al) - o L, SP	y – l clim examp 9 Ho PSS, 45 Ho	our
Unit IV Need for do Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate Course Ou References 9. IPCC F 10. McGuf Sons, I	Downscaling ownscaling of - Ensembl Lateral bour and their lin Analysis J alidation - p change Imp ttcomes: After com 1.Know th 2.Know th 5: Fourth Assess ffie, K. and td, Chiches	- Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.  Post Processing ost processing – Introduction to Analysis tools - Ferret, R, G act - Vulnerability assessment – adaptation strategies.  I pletion of the course, Student will be able to ne causes of climate change ne effects of climate change ssment Report, Cambridge University Press, Cambridge, UK Henderson-Sellers, A. "A Climate Modelling Primer, Third	rious mc	on and al) - o L, SF	y – l clim examp 9 Ho PSS, 45 Ho	our
Unit IV Need for de Selection o variables - from each a Unit V a. Model va ArcGIS b. Climate Course Ou References 9. IPCC F 10. McGuf Sons, I 11. Neelin 12. Thoma	Downscaling ownscaling of - Ensembl Lateral bour and their lin Analysis alidation - p change Imp tcomes: After com 1.Know th 2.Know th 2.Know th s: Fourth Assee fie, K. and td, Chichess David J, "C s Stocker, "	- Selection of GCMs for regional climate change studies - Enes, Model Domain (Spatial domain and temporal domain), R ndary conditions - Methods of downscaling (Statistical and I nitations.  Post Processing ost processing – Introduction to Analysis tools - Ferret, R, G act - Vulnerability assessment – adaptation strategies.  pletion of the course, Student will be able to ne causes of climate change ne effects of climate change ssment Report, Cambridge University Press, Cambridge, UK Henderson-Sellers, A. "A Climate Modelling Primer, Third ter, UK. ,2005	Cotal: Fotal: Edition	on and al) - o L, SF	y – l clim examj 9 Ho PSS, 45 Ho	our



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV005		ENVIRONMENTAL POLICIES AND LEGISLATION	L	Т	P	C
			3	0	0	3
Course Ob						
	-	knowledge on the policies, legislations, institutional frame wor	ck and	enfo	rcem	ent
TT •4 T		ns for environmental management in India.			0.11	
Unit I	Introducti				9 H	ours
		nd Environmental Protection – National Environmental and Polluter Pays Principle – Concept of absolute liability – n			-	
		nts and Protocols – Montreal Protocol, Kyoto agreement, Rio				
	0	on Act, Water (P&CP) Act, Air (P&CP) Act – Institutional	uccia		1-	
	SPCB/CPC					
Unit II		&CP) Act, 1974			8 H	
		egulatory agencies - responsibilities of Occupier Provision rela				
		Consent to establish, Consent to operate – Conditions of the co				
	• •	ares, State Water Laboratory – Appellate Authority – Penalties			on of	
consent cor	ditions etc.	Provisions for closure/directions in apprehended pollution situ	lation	•		
Unit III	Air (P&C	P) Act, 1981			8 H	ours
Power & fu	nctions of re	egulatory agencies - responsibilities of Occupier Provision rela	ting to	o pre	ventic	m
		Consent to establish, Consent to operate - Conditions of the co				-
	• •	ares, State Air Laboratory – Appellate Authority – Penalties f			1 of	
consent cor	ditions etc.	Provisions for closure/directions in apprehended pollution situ	lation			
Unit IV	<b>Environm</b>	ent (Protection) Act 1986			13 He	ours
Genesis of	the Act – de	legation of powers – Role of Central Government - EIA Notifi	cation	ı – Si	tting o	of
		one Regulation - Responsibilities of local bodies mitigation				
-		Management - Responsibilities of Pollution Control Boards u				
		occupier, authorization - Biomedical waste rules - responsibil	ities o	of gen	erato	rs
and role of	Pollution Co	ontrol Boards				
Unit V	<b>Other Top</b>	nics			7 He	ours
		Indian Forest Act, Public Liability Insurance Act, CrPC, IPC -	Public	: Inte		
Litigation -	Writ petitio	ns - Supreme Court Judgments in Landmark cases.				
		Tot	alı		45 Ho	nure
Course Ou	tcomes:	10	ai.		-5 III	<i>j</i> ul 3
204150 04		pletion of the course, Student will be able to				
		the National environmental legislations and the policies				
		rogrammes to comply with the legal requirements related to or	ganiz	ation	s	
	1 1		5 -			



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		MEMBRANE TECHNOLOGIES FOR WATER AND WASTE WATER TREATMENT	L	T	P	С
		WASIE WAIER IREAIMENT	3	0	0	3
Course Ob	jectives:		U	V	Ū	U
		ce the concept and principles of membrane separation and its	applic	ation	s in w	ater
		vater treatment.				
Unit I		Filtration Processes	~1		10 He	
Flow filtra porous, nor	tion - Mem	systems- Theory of Membrane separation – mass Transport C brane Filtration- Flux and Pressure drop -Types and choi nmetric and asymmetric – Plate and Frame, spiral wound and embranes	ce of	mem	brane	
Unit II	<b>Membran</b>	e Systems			10 He	ours
process con Pervaporati Liquid men component Economics	ntrol and ap ion – Liquid nbrane - Me s – Design o of Membran	·	ocess e and – Mer	desig Emul nbrar	n- sion ne Sys	tem
Unit III		<mark>e Bioreactors</mark> ical Perspective of MBRs, Biotreatment Fundamentals, Bioma	C .		9 H	
Principles,	Fouling an	d Fouling Control, MBR Design Principles, Design Assig commercial Technologies, Case Studies.	-			
Unit IV		ent Systems			8 H	ours
Membrane	Fouling – C - monitoring	ent Systems ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic			nd	ours
Membrane strategies - Biofoulant <b>Unit V</b>	Fouling – C - monitoring control.	ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic ies	al clea	aning	nd , 8 He	
Membrane strategies - Biofoulant <b>Unit V</b> Case studie	Fouling – C - monitoring control. Case Stud s on the desi	ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic	al clea	aning	nd , 8 He	
Membrane strategies - Biofoulant <b>Unit V</b> Case studie effluent dis	Fouling – C - monitoring control. Case Stud s on the des charge Plant	ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic ies gn of membrane-based water and wastewater treatment syster	ns – z	ero L	nd , 8 He	ours
Membrane strategies - Biofoulant Unit V Case studie effluent dis Course Ou	Fouling – C - monitoring control. Case Stud s on the dest charge Plant tcomes:	ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic ies gn of membrane-based water and wastewater treatment syster s – Desalination of brackish water.	ns – z	ero L	nd , <b>8 H</b> d iquid	ours
Membrane strategies - Biofoulant Unit V Case studie effluent dis Course Ou	Fouling – C - monitoring control. Case Stud so on the dest charge Plant ter completion 9. familia	ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic ies gn of membrane-based water and wastewater treatment syster s – Desalination of brackish water. To on of the course, Student will be r with main membrane processes, principles, separation	ns – z	ero L	nd , 8 Ho iquid 45 Ho	ours
Membrane strategies - Biofoulant Unit V Case studie effluent dis Course Ou	Fouling – C – monitoring control. Case Stud s on the desi charge Plant ter completion 9. familia applica	ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic ies gn of membrane-based water and wastewater treatment syster s – Desalination of brackish water. To on of the course, Student will be r with main membrane processes, principles, separation tions	ns – z	ero L	nd , 8 Ho iquid 45 Ho	ours
Membrane strategies - Biofoulant Unit V Case studie effluent dis Course Ou	Fouling – C - monitoring control. Case Stud s on the dest charge Plant ter completive 9. familia applica 10. unders	ontrol of Fouling and Concentration Polarisation-Pretreatment of Pretreatment – Langlier Index, Silt Density Index, Chemic ies gn of membrane-based water and wastewater treatment syster s – Desalination of brackish water. To on of the course, Student will be r with main membrane processes, principles, separation	ns – z	ero L	nd , 8 Ho iquid 45 Ho	ours



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV009		REMOTE SENSING AND GIS APPLICATIONS IN ENVIRONMENTAL MANAGEMENT	L	T	Р	C
			3	0	0	3
Course Ob	jectives:				Ū	
		cate the students on aspects of Remote Sensing				
	10. Develo	pp the different remote sensing technique				
	11. To edu	cate the students on aspects of GIS and data management				
	12. Develo	op the GIS Applications for monitoring and management of	environ	ment		
Unit I	Remote Se	nsing Elements			8 H	our
Historical F	Perspective, I	Principles of remote sensing, components of Remote Sensin	ig, Energ	gy sou	irce a	nd
•		on, Electromagnetic spectrum, Energy interaction, Spectr	al respo	nse p	attern	of
earth surfac	ce features, E	Energy recording technology.				
Unit II		ensing Technology			9 H	
		e Sensing Systems, Aerial photographs, Photographic syste				
1 / 1	scanning M	[-14]	MUNIO PO		cenci	
-	-	lultispectral remote sensing, Thermal remote sensing, Micro	Jwave Ie	mote	sensi	ng
-	-	nsors, RADAR, LIDAR	Jwave Ie	mote	501151	ng
– Active an	nd passive ser				9 He	_
– Active an Unit III Social impa	nd passive ser Social Imp act assessment	nsors, RADAR, LIDAR Dact Assessment and EIA Documentation nt - Relationship between social impacts and change in com	munity	and	9 H	ours
– Active an Unit III Social impa institutiona	nd passive ser Social Imp act assessment arrangement	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com nts. Individual and family level impacts. Communities in tra	munity a	and Docur	9 H	ours
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impairs institutiona</li> <li>of EIA find</li> </ul>	nd passive ser	nsors, RADAR, LIDAR Dact Assessment and EIA Documentation nt - Relationship between social impacts and change in com	munity a	and Docur	9 H	ours
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impainstitutiona</li> <li>of EIA find</li> <li>preparation</li> </ul>	nd passive ser Social Imp act assessment arrangement lings – plann n.	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com nts. Individual and family level impacts. Communities in tra	munity a	and Docum port	9 H	ours
– Active an Unit III Social impa institutiona of EIA find preparation Unit IV	nd passive sen	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia	munity ansition l als – Rep	and Docum port	9 Ho menta	ours
– Active an Unit III Social impa institutiona of EIA find preparation Unit IV Environme Rehabilitati	nd passive ser Social Imp act assessment act arrangement arrangement ings – plann n. Environm ontal Managent ion Plans – P	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm	munity ansition lass – Rep gation an	and Docum port	9 He menta 10 He	ours
– Active an Unit III Social impa institutiona of EIA find preparation Unit IV Environme Rehabilitati	nd passive ser Social Imp act assessment act arrangement arrangement ings – plann n. Environm ontal Managent ion Plans – P	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig	munity ansition lass – Rep gation an	and Docum port	9 He menta 10 He	ours
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impainstitutiona</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitati</li> <li>Ethical ar</li> </ul>	nd passive ser Social Imp act assessmen act arrangemen ings – plann n. Environm ntal Manager ion Plans – P nd Quality as	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm	munity ansition lass – Rep gation an	and Docum port	9 He menta 10 He	ours nudi
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impainstitutiona</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitati</li> <li>Ethical ar</li> <li>Unit V</li> </ul>	A passive set Social Imp act assessment act assessment act assessment act assessment act assessment plans – plann act Environm Environm	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig- Policy and guidelines for planning and monitoring programm spects of Environmental Impact Assessment- Case Studies.	munity a insition l als – Rep gation an nes – Po	and Docum port id st pro	<b>9 H</b> menta <b>10 H</b> oject a <b>9 H</b>	ours nudi
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impainstitutiona</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitati</li> <li>Ethical ar</li> <li>Unit V</li> <li>Environme</li> <li>Assessmention</li> </ul>	A passive set Social Imp act assessment act assessment act assessment act assessment act assessment plans – plann model of the plans Environm on Plans – P and Quality assess Environm matal risk assest t – Exposure	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm spects of Environmental Impact Assessment- Case Studies. <b>ental Risk Assessment and Management</b> Factors, Tools for Environmental Risk Assessment– HAZO	imunity a insition l als – Rep gation an nes – Po Evaluatio DP and F	and Document port ad st pro	9 Ho menta 10 Ho ject a 9 Ho xposi	ours nudi
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impainstitutional</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitation</li> <li>Ethical ar</li> <li>Unit V</li> <li>Environme</li> <li>Assessment</li> <li>methods – I</li> </ul>	A passive ser Social Imp act assessment act assessment act assessment act assessment act assessment act assessment act assest <b>Environm</b> act and act assest act act assest act act assest act act act act act act act act act act	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm spects of Environmental Impact Assessment- Case Studies. <b>ental Risk Assessment and Management</b> essment framework-Hazard identification -Dose Response E Factors, Tools for Environmental Risk Assessment– HAZO ad fault tree analysis – Multimedia and multipath way expose	munity a insition l als – Rep gation an nes – Po Evaluatio DP and F sure mod	and Document oort id st pro- EMA leling	9 Ho menta 10 Ho oject a 9 Ho xpost	our ation our our ure
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impainstitutional of EIA find preparation</li> <li>Unit IV</li> <li>Environmer</li> <li>Enhical ar</li> <li>Unit V</li> <li>Environmer</li> <li>Assessment</li> <li>methods – 1</li> <li>contaminant</li> </ul>	A passive set Social Imp act assessment act assessment act assessment act assessment act assessment act assessment <b>Environm</b> act assest <b>Environm</b> act assest <b>Environm</b> act assest act act act assest act act act act act act act act act act	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm spects of Environmental Impact Assessment- Case Studies. <b>ental Risk Assessment and Management</b> Factors, Tools for Environmental Risk Assessment– HAZO	munity a insition l als – Rep gation an nes – Po Evaluatio DP and F sure mod	and Document oort id st pro- EMA leling	9 Ho menta 10 Ho oject a 9 Ho xpost	ours audi ours ure
<ul> <li>Active an</li> <li>Unit III</li> <li>Social impainstitutional of EIA find preparation</li> <li>Unit IV</li> <li>Environmer</li> <li>Enhical ar</li> <li>Unit V</li> <li>Environmer</li> <li>Assessment</li> <li>methods – 1</li> <li>contaminant</li> </ul>	A passive ser Social Imp act assessment act assessment act assessment act assessment act assessment act assessment act assest <b>Environm</b> act and act assest act act assest act act assest act act act act act act act act act act	nsors, RADAR, LIDAR <b>Dact Assessment and EIA Documentation</b> nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia <b>ental Management Plan</b> ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm spects of Environmental Impact Assessment- Case Studies. <b>ental Risk Assessment and Management</b> essment framework-Hazard identification -Dose Response E Factors, Tools for Environmental Risk Assessment– HAZO ad fault tree analysis – Multimedia and multipath way expose	munity a insition l als – Rep gation an nes – Po Evaluatio DP and F sure mod	and Document oort id st pro- EMA leling	9 Ho menta 10 Ho oject a 9 Ho xpost	ours audi ours ure
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

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1701MGX001		PROFESSIONAL ETHICS	L	Т	P	С
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Course Objecti						
		ary goal is to stimulate critical and responsible reflection or				
		g engineering practice and to provide the conceptual tools r	necessa	ary fo	r	
		nose issues.				
		nake the students aware of the different ethical issues, code	s of co	nduc	t for	
TT		n the society and moralities in an organization.			0.11	
Unit I		JCTION & HUMAN VALUES	41 1	r · ·	9 H	ours
		Work Ethic - Team work – Types of Ethics - Respect for Of				~
and religion-Ca		ge - Valuing Time - Co-operation - Commitment- Self-Con	maenc	e - Ci	istom	s
Unit II		ERING ETHICS			9 H	
		of moral issues – Types of Inquiry – Professional account	ahility	_ Sel		
		rg's Theory – Gilligan's Theory – Theories about Right Ac				
of IEEE and Ins			lion	Lune	ui 000	103
Unit III		& RESPONSIBILITY OF ENGINEERS			10 He	mrs
		tion – Safety and Risks – Risk – benefit analysis – Computer	er Tecł			Juis
		igineering standards – Communicating Risk and Public Poli				al
		and Employee Rights – Whistle Blowing – Collective Bar				
of Interest.	6					
Unit IV	ENGINE	ER'S ROLE			9 He	ours
Engineers as Ma	anagers, Adv	visors, Consultants, Experts and Witness – Engineers role in	induc	try a	nd soo	
Theories -1		isons, e chisananis, Enperis ana A fintess Engineers fore n	1 maus	u y u	14 000	eiety
- Theories abou	t right actior	n – Moral leadership - Collegiality and loyalty – IPR – Disc				
gas tragedy case	study.	n – Moral leadership - Collegiality and loyalty – IPR – Disc				
gas tragedy case Unit V	study. GLOBAL	n – Moral leadership - Collegiality and loyalty – IPR – Disc ISSUES	rimina	tion -	• Bhoj 8 Ho	pal
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1702CE305		BUILDING MATERIALS AND RESOURCE PLANNING	L	Т	Р	C
			3	0	0	3
Course Obje		students an understanding of typical and potential applicati	on of	Buil	ding	
		e that students know about the manufacturing process of Basigning procedure of concrete	uildin	g ma	terial	5
		dents an appreciation of the effective use of common and m	oderi	n mat	erials	in
Unit I	Stones – b	ricks – concrete blocks			9 H	ours
stone work – Strength – V	- Bricks – C Vater Absorp	al – Criteria for selection – Tests on stones – Deterioration Classification – Manufacturing of clay bricks – Tests on br ption – Efflorescence – Bricks for special use – Refractor eight concrete blocks.	ricks	– Co	mpres	sive
Unit II	Lime – cen	nent – aggregates – mortar			9 H	our
	Crushing st	ey – Setting time – Industrial byproducts – Fly ash – Aggreg trength – Impact strength – Flakiness Index – Elongation and Bulking.				
Unit III	Concrete				9 H	our
Strength Con- Unit IV Timber – Ma: Aluminum co Sealants for j	crete and HP Timber an rket forms – omposite par oints – Fiber	<ul> <li>apture – Tests – Mix specification – Mix proportioning – C – Self compacting Concrete – Other types of Concrete – Du d modern material</li> <li>Industrial timber– Plywood – Veneer – Therma Cole – Panels</li> <li>nel – Uses – Paints – Varnishes – Distempers – Bitumens.</li> <li>glass reinforced plastic – Clay products – Refractories – Co ranes and Geotextiles for earth reinforcement.</li> </ul>	rabili of la Glass	ty of minat	Conc 9 H tes – S erami	rete ours Stee cs -
Unit V	Materials 1	management			9 H	our
	anagement -	Material Procurement and Delivery - Inventory Control - T	Tradeo	offs o		
		Tot	al:		45 H	our
Further Rea	2. On con	pletion of this course the students will be able to Compare	-			of
		ommon and advanced building materials and understand th al applications of these materials	71			
Course Outc	omes:	ial applications of these materials				
Course Outc	omes: After comp 1. Summari 2.Explain tl 3. Explain concrete.		ection.	f othe		



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1702CE604	-	W	ATER	SUPP	LY ENC	GINEE	RING				L 3	T	P	$\frac{C}{2}$
Course Obje	ativos.										3	0	0	3
Course Obje		o exa	mine f	he wate	er supply	system	and cor	nvevan	ce syst	em				
					to evalu						ced v	vater	treatr	nen
		ystem		5										
	6. To	o trai	n the s	tudents	to analy	ze water	r distrib	oution s	ystem	and sup	oply t	o buil	dings	•
Unit I	<b>PLANNIN</b>	NG F	OR W	ATER	SUPPL	A SYST	ГЕМ						08 Ho	our
Public water water and tl Development	heir characte	teristi	ics -Sı	urface	and Gro	oundwat	er- Im	poundi	ng Re	servoir	dema Wel	nd -S 1 hyc	ource Irauli	s c cs
Unit II	<b>CONVEY</b>					,							07 He	our
U <b>nit III</b> Objectives -	ings appurter   <mark>WATER 1</mark> Unit operati	TRE tions	ATMI and pr	ENT rocesses	s - Princ	ciples, fi	unction	s desig	n and	drawin	ig of	Scree	12 Ho	
nixers, floce							oisintec	tion- K	esidue	Manag	emen			
Unit IV	ADVANC.	CED	WATE	ID TODI									09 He	
Membrane Recent advan	nces-Membra	anese Constr Cane p DIST	remov ruction process TRIBU	al, Def and O es. TION	luoridation peration	on and c 1 & Ma U <b>PPLY</b>	intenan <mark>TO BU</mark>	ce asp <mark>JILDIN</mark>	ects of other	f Wate:	r Tre	; - De atmer	salina nt Pla <b>09 H</b> (	tio ints
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- Membrane Recent advan Unit V Requirements design - An detection, Mo	Systems-Co aces-Membra WATER I s of water d alysis of d ethods. Princ	anese constr cane p DIST distri distri ciple	remov ruction process <b>FRIBU</b> bution bution s of de	ral, Def and O es. TION -Comp networ esign of	luoridation peration AND SU ponents - rks –Pip f water s	ion and c Ma WPPLY -Service be Appu supply ir	intenan TO BU reserv urtenance buildi	ce asp <b>ILDIN</b> oirs -F ces -op ngs -H	ects of NGS	f Wates	r Tre draw main conne	s - De atmer ings tenan ction	salina nt Pla 09 Ho -Netv ce -I	tio int: <b>Dui</b> vor Lea ure
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

1702CE652	-	ENVIRONMENTAL AND IRRIGATION DESIG AND DRAWING		T	P	C
			3	0	0	3
Course Obje		about the design of environmental structures				
		he pictorial representation of irrigation structures				
	2.10 KIIOW I	ne pictorial representation of irrigation structures				
Unit I	WATER S	UPPLY AND TREATMENT			08 H	ours
Design &Dra	wing of flash	1 mixer, flocculator, clarifier – Slow sand filter – Rapid sa	and filter	_		
		e towers – Service reservoirs – Pumping station – House				
connection fo	or water supp	ly and drainage.				
Unit II	SEWAGE	TREATMENT & DISPOSAL			07 H	ours
		reen chamber - Grit channel - Primary clarifier - Activate	d sludge		07 11	ours
		coxidation ditch – Trickling filters – Secondary clarifiers				
		beds – Waste stabilisation ponds - Septic tanks and dispos				
arrangements						
Unit III		DING STRUCTURES			12 H	ours
		s Weir, Tank Sluice with tower road - Drawing showing	plan,			
elevation, hal	f section incl	luding foundation details.				
Unit IV	CANAL T	RANSMISSION STRUCTURES			09 H	ours
		educts – Super passage – Canal siphon – Canal Drops- D	rawing		0, 11	0415
		nd foundation details.	8			
					00 H	
Unit V		EGULATION STRUCTURES	· 1	.	09 H	ours
		Regular – Canal escape- Proportional Distributors – Drav Id foundation.	ving shov	ing		
detalled plait,	elevation an		Total:		45 H	
Ewith or Doo	dina		1 otal:		45 H	ours
Further Rea		e and draw advanced irrigation and environmental structu				
Course Outc		and draw advanced irrigation and environmental structu	res			
Course Oute		letion of the course, Student will be able to				
		vironmental treatment system				
		ne irrigationimpounding structures				
		e canal transmission structures				
		ne canal regulation structures				
References:	in debigir th					
	"Environme	ntal Engineering", Vol.1 Khanna Publishers, New Delhi,	2005.			
		"Irrigation Design and Drawing" Published by MrsL.Bar		Funi e	ast	
Godavari Dis			iumum,		ust	
		Engineering and Hydraulic Structures Oxford and IBH Pu	ıblishing	co N	ew De	elhi
2002.			B	, - ,		
	"Water Supp	bly Engineering", Vol. I Standard Book House, New Delh	i, 2005.			
		Jain and Arun K Jain, "Water Supply Engineering", Lax		ation	Dut	Ltd
C . I MIIIII UN D.		Jaill and Aluli N Jaill. Waler annuly Engineering Tax		allons		
New Delhi, 2		Jain and Arun K Jain, water Supply Engineering, Lax		ations	5 T VI	



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Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

1702CE702		WASTE WATER ENGINEERING	L	Т	P	C
			3	0	0	3
<b>Course Obje</b>	ctives:					
	1. To under	stand the importance of planning and design of sewerage sy	ystem.			
	2. To create	an ability to evaluate the waste water treatment system.				
	3. To impar	the signification of disposal of Sewage.				
Unit I	PI ANNIN	G FOR SEWERAGE SYSTEMS			09 H	ours
		eration – Effects – Estimation of sanitary sewage flow – E	Estimation			
		eteristics and composition of sewage and their significant				
Legislation re		tensites and composition of sewage and their signmean		ent s	andan	us
Unit II	DESIGN O	FSEWER			09 H	ours
		flow in sewers – Design period - Design of sanitary and sto	orm sewers			
		ers– Laying, joining & testing of sewers – Forces acting of				
		ewer appurtenances – Pumps – selection of pumps and pipe				
		e pipe and two pipe system.	e Diamage		4111011	-8
System for B	andings on					
Unit III	PRIMARY	TREATMENT OF SEWAGE			09 H	ours
Objective – C	nit Operation	and Processes - Selection of treatment processes - Princi	pies, funct	ions (	lesigr	and
		ambers and primary sedimentation tanks – Operation and ank, Grey water harvesting.			aspec	15 -
Unit IV	<b>SECONDA</b>	RY TREATMENT OF SEWAGE			09 H	ours
Objective - S	election of T	reatment Methods - Principles, Functions, Design and Dra	wing of U	nits -	Activ	vated
		ng filter, other treatment methods - Oxidation ditches, UA				
Ponds - Rec	lamation and	Reuse of sewage - Recent Advances in Sewage Treats	ment – Co	onstru	iction	
Operation &	Maintenance					and
						and
Unit V	DISPOSAL	of Sewage Treatment Plants.			09 H	
		of Sewage Treatment Plants. OF SEWAGE AND SLUDGE				ours
Standards for	Disposal - N	of Sewage Treatment Plants. OF SEWAGE AND SLUDGE Iethods – dilution – Self-purification of surface water bod	ies – Oxyg	gen sa	ag cui	ours ve –
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Standards for Land disposa Thickening – Advances in S <b>Further Rea</b>	Disposal - M 1 – Sewage fi - Sludge dig Sludge Treatr ding: 3. Des 4. Des omes: After compl	of Sewage Treatment Plants. OF SEWAGE AND SLUDGE Iethods – dilution – Self-purification of surface water bod arming – Deep well injection – Soil dispersion system – estion – Biogas recovery – Sludge Conditioning and I ment and disposal.	ies – Oxyg Sludge ch Dewatering <b>Total:</b> gering the	gen sa aracte g – c	ag cur erizati lispos 45 H	ours ve – on – al – ours
Standards for Land disposa Thickening – Advances in S <b>Further Rea</b>	Disposal - M 1 – Sewage fi Sludge dig Sludge Treatr ding: 3. Des 4. Des omes: After compl 6. Exa 7. Des	of Sewage Treatment Plants. OF SEWAGE AND SLUDGE Iethods – dilution – Self-purification of surface water bod arming – Deep well injection – Soil dispersion system - estion – Biogas recovery – Sludge Conditioning and I nent and disposal. ign the necessary treatment units for energy conservation. ign the suitable disposal unit for the sludge without endang etion of the course, Student will be able to mine the waste water quality characteristics and standards. ign sewerage systems and discuss about the treatment pro-	ies – Oxyg Sludge ch Dewatering <b>Total:</b> gering the	gen sa aracte g – c	ag cun erizati lispos 45 H	ours ve – on – al – ours nt.
Standards for Land disposa Thickening – Advances in S <b>Further Rea</b>	Disposal - M 1 – Sewage f Sludge dig Sludge Treatr ding: 3. Des 4. Des omes: After compl 6. Exa 7. Des prin	of Sewage Treatment Plants. OF SEWAGE AND SLUDGE Iethods – dilution – Self-purification of surface water bod arming – Deep well injection – Soil dispersion system - estion – Biogas recovery – Sludge Conditioning and I nent and disposal. Sign the necessary treatment units for energy conservation. ign the suitable disposal unit for the sludge without endang etion of the course, Student will be able to mine the waste water quality characteristics and standards. ign sewerage systems and discuss about the treatment pro- nary level.	ies – Oxyg Sludge ch Dewatering <b>Total:</b> gering the	gen sa aracte g – c	ag cun erizati lispos 45 H	ours ve – on – al – ours nt.
Standards for Land disposa Thickening – Advances in S <b>Further Rea</b>	Disposal - M 1 – Sewage dig Sludge Treatr ding: 3. Des 4. Des omes: After compl 6. Exa 7. Des prin 8. Des	of Sewage Treatment Plants. OF SEWAGE AND SLUDGE Iethods – dilution – Self-purification of surface water bod arming – Deep well injection – Soil dispersion system – estion – Biogas recovery – Sludge Conditioning and I nent and disposal. ign the necessary treatment units for energy conservation. ign the suitable disposal unit for the sludge without endang etion of the course, Student will be able to mine the waste water quality characteristics and standards. ign sewerage systems and discuss about the treatment pro- nary level. ign the various unit operations for waste water treatment.	ies – Oxyg Sludge ch Dewatering <b>Total:</b> gering the	gen sa aracte g – c	ag cun erizati lispos 45 H	ours ve – on – al – ours nt.
Standards for Land disposa Thickening – Advances in S <b>Further Rea</b>	Disposal - M 1 – Sewage d Sludge dig Sludge Treatr ding: 3. Des 4. Des omes: After compl 6. Exa 7. Des prin 8. Des 9. Des	of Sewage Treatment Plants. OF SEWAGE AND SLUDGE Iethods – dilution – Self-purification of surface water bod arming – Deep well injection – Soil dispersion system – estion – Biogas recovery – Sludge Conditioning and I ment and disposal. ign the necessary treatment units for energy conservation. ign the suitable disposal unit for the sludge without endang etion of the course, Student will be able to mine the waste water quality characteristics and standards. ign sewerage systems and discuss about the treatment pro- nary level. ign the various unit operations for waste water treatment. ign the sludge treatment and disposal methods.	ies – Oxyg Sludge chi Dewatering <b>Total:</b>	gen sa aracte g – c envire by ste	ag cui prizati dispos <b>45 H</b> onme ep doi	ours ve – on – aal – ours nt.
Standards for Land disposa Thickening – Advances in S Further Rea	Disposal - M 1 – Sewage d Sludge dig Sludge Treatr ding: 3. Des 4. Des omes: After compl 6. Exa 7. Des prin 8. Des 9. Des 10. Per	of Sewage Treatment Plants. OF SEWAGE AND SLUDGE Iethods – dilution – Self-purification of surface water bod arming – Deep well injection – Soil dispersion system – estion – Biogas recovery – Sludge Conditioning and I nent and disposal. ign the necessary treatment units for energy conservation. ign the suitable disposal unit for the sludge without endang etion of the course, Student will be able to mine the waste water quality characteristics and standards. ign sewerage systems and discuss about the treatment pro- nary level. ign the various unit operations for waste water treatment.	ies – Oxyg Sludge chi Dewatering <b>Total:</b>	gen sa aracte g – c envire by ste	ag cui prizati dispos <b>45 H</b> onme ep doi	ours ve – on – aal – ours nt.



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1703CE006		SOLID WASTE MANAGEMENT	]	L	Т	Р	C
				3	0	0	3
Course Obje	ctives:		1				
	To study th	e Sources and types of municipal solid wastes					
	To impart t	he knowledge of On-site Processing, collection and tran	sfer of s	olic	l was	te.	
	To acquire	the knowledge of Off-site Processing and waste dispos	al mana	gen	nent.		
Unit I	SOURCES	AND TYPES OF MUNICIPAL SOLID WASTES				8 H	ours
methods of sa	impling and o iple of solid	wastes - Quantity – factors affecting generation of solid characterization- Effects of improper disposal of solid w waste management – social & economic aspects - Public	astes – p	ubl	ic he	alth	s —
Unit II	<b>ON-SITE S</b>	STORAGE & PROCESSING				8 H	ours
On-site storag		materials used for containers – on-site segregation of so	lid wast	es -	- publ	lic he	alth
& economic a	aspects of sto	rage – options under Indian conditions – Critical Evalua	tion of (	Dpti	ions.		
Unit III		TION AND TRANSFER					ours
		ypes of vehicles - Manpower requirement - collection				fer	
		ocation, operation & maintenance; options under Ind	ian cond	itio			
Unit IV		PROCESSING				12 He	
		Equipment; Resource recovery from solid wastes - con	nposting	, in	cinera	ation,	
		ndian conditions.					
Unit V	<b>DISPOSAI</b>					9 H	ours
		anitary landfills – site selection, design and operation of tion & treatment	sanıtary	T			
			Total:		4	15 He	ours
Further Rea	ding:						
	They can c	ategorize the types of wastes					
	They can cl	hoose the disposal units					
Course Outc							
		letion of the course, Student will be able to					
		e Sources and types of municipal solid wastes					
		e suitable method of Segregation of solid waste under Ir	ndian con	ndit	ion.		
		e methods of collectionand transfer of solid wastes					
		te the suitable Off-site Processing techniques					
	Choose the	various options for disposal of wastes and their selection	n criteri	a			
References:							
	-	id Waste Management, CPHEEO, Ministry of Urbar	n Develo	pm	ent,		
Government							
	and P.A.Re	ebers, Municipal Solid Wastes - problems and Solut	tions, Le	wis	Publ	isher	3,
1997.							



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				L	Т	P	C
1703CE009		GROUNDWATER ENGINEER	ING	3	0	0	3
Course Obje	ctives:						
		e the student to the principles of G	roundwater govern	ning Equati	ons		
		risticsofdifferentaquifers	-	• •			
	2.Character	ticsofdifferentaquifers					
	3.To unders	and the techniques of development	and management of	of groundwa	ater		
	4.To be intr	duced to the different theories of the	affic flow				
	5.To be awa	e of the importance of traffic safet	у				
Unit I		OLOGICAL PARAMETERS				9 H	ours
Introduction-Wa	ater bearing Prop	ies of Rock-Type of aquifers - Aquifer pro	perties — permeability, s	pecific yield, t	ansmissi	vity and	ł
		stimation-Ground water table fluctuation ar					
Potential in India-	-GEC norms.		-		•		
Unit II	<b>WELLHY</b>	RAULICS				9H	ours
Objectiveso	fGroundwate	nydraulics–Darcy'sLaw-Groundwa	terequation-steady	ystate			
flow.Dupuit	Forchheimer	ssumption-Unsteadystateflow-The	smethod-JacobMe	thod-Slug	tes	sts	_
Imagewell t	heory –Partia	penetrationsof wells					
Unit III	<b>GROUND</b>	ATER MANAGEMENT				9H	ours
Need for Mar	nagement Mc	el – Database for groundwater mai	nagement _ground	water halar	nce stud	lv_	
	-	al model – Conjunctive use – Colle				<i>.</i> ,	
muoduction		-		ination gai	cry		
Unit IV		ATER QUALITY					ours
		rigin, movement and quality - Wa				stheti	с
aspects of wa	ter quality - S	lline intrusion – Environmental con	ncern and Regulate	ory require	nents		
Unit V	<b>GROUND</b>	ATER CONSERVATION				9 H	ours
Artificial recl	narge techniq	es - Remediation of Saline intrusion	on-Ground water	managemei	nt studi	es –	
		Contamination source inventory,					
- Ground wat	er Pollution a	d legislation.					
				Total:		45 H	ours
Further Rea	ding			Total.		45 11	Juis
Further Kea		water to improving quality parame	tor				
		esource and hydrology for features					
Course Outc		source and nydrology for reatures	lieeu.				
Course Oute		vill be able to understand aquifer p	romantias and its dr	morning off	or the		
		thecourse.Itgivesanexposuretowar					
	ofgroundwa		uswendesignanup	racticalprot	Jiems		
	2 Studento	illbeabletounderstandtheimportanc	enfartificialrechar	aeandarour	dwata	•	
	qualityconc		conartinenaneenar	geanugrour	uwatel	L	
		onalgroundwaterflowanddesignwa	tomvalla				
		· · ·	ICI WEIIS				
		aterqualityparameters	ity poporator				
	5.10 sarety	round water improvements of qual	ny parameter				



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### **ME ENVIRONMENTAL ENGINEERING**

		ENVIRONMENTAL CHEMISTRY		<b>T</b>	P	C
			3	0	0	3
Course Ob						
		acate the students about water chemistry				
		part knowledge in the area of air and soil chemistry				
		part knowledge on the transformation of chemicals in t	the environ	ment		
Unit I	Introducti				9 He	ours
		s balance-Chemical equilibrium, acid base, solubility p				
		photeric hydroxides, CO2 solubility in water and specie	es distribut	ion –		
Chemical k		order- 12 Principles of green chemistry.				
Unit II	<mark>Aquatic C</mark>				11 He	
-		rs- environmental significance and determination; Fate				tic
environmen		zation, partitioning, hydrolysis, photochemic				
		c chemicals-Metals, complex formation, oxidation and				_
		- sorption- Colloids, electrical properties, double layer	theory, env	viron	menta	1
		, coagulation.				
Unit III		ric Chemistry			7 He	
		chemical and photochemical reactions photochemic				
		gases and global warming, CO2 capture and sequestrat		rain-	origi	n
		ticulates. Air quality parameters-effects and determinat	tion.			
Unit IV	Soil Chem				9 He	
		n of soil-Clays- cation exchange capacity-acid base and				ns
		emicals in soil-Reclamation of contaminated land; salt	t by leachir	ig-He	avy	
	lectrokinetic	remediation.				
Unit V	• •					
		ental Chemicals			9 Ho	ours
	lls-Chemica	<mark>ental Chemicals</mark> l speciation –Speciation of Hg &As- Organic chemical				ours
Dioxins,PC	ıls-Chemica Bs,PAHs an	ental Chemicals l speciation –Speciation of Hg &As- Organic chemical d endocrine disruptors and their Toxicity- Nano mater				ours
Dioxins,PC	ıls-Chemica Bs,PAHs an	<mark>ental Chemicals</mark> l speciation –Speciation of Hg &As- Organic chemical				ours
Dioxins,PC	ıls-Chemica Bs,PAHs an	ental Chemicals l speciation –Speciation of Hg &As- Organic chemical d endocrine disruptors and their Toxicity- Nano mater	ials, CNT,	titani	a,	
Dioxins,PC composites,	lls-Chemica Bs,PAHs an , environme	ental Chemicals l speciation –Speciation of Hg &As- Organic chemical d endocrine disruptors and their Toxicity- Nano mater		titani		
Dioxins,PC	Ils-Chemica Bs,PAHs an , environmer eading	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical I endocrine disruptors and their Toxicity- Nano mater ntal applications.	ials, CNT,	titani	a,	
Dioxins,PC composites, Further Re	Is-Chemica Bs,PAHs an environmen eading To analyze	ental Chemicals l speciation –Speciation of Hg &As- Organic chemical d endocrine disruptors and their Toxicity- Nano mater	ials, CNT,	titani	a,	
Dioxins,PC composites,	Ils-Chemica Bs,PAHs an environmen eading To analyze tcomes:	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical I endocrine disruptors and their Toxicity- Nano mater Intal applications.	ials, CNT,	titani	a,	
Dioxins,PC composites, Further Re	Ils-Chemica Bs,PAHs an environment eading To analyze tcomes: After comp	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical id endocrine disruptors and their Toxicity- Nano matern intal applications. and create a solution for environmental issues. bletion of the course, Student will be able to	ials, CNT,	titani	a,	
Dioxins,PC composites, Further Re	Ils-Chemica Bs,PAHs an environmen eading To analyze tcomes: After comp 21. Disting	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical id endocrine disruptors and their Toxicity- Nano mater intal applications. and create a solution for environmental issues. pletion of the course, Student will be able to guish the chemistry involved	ials, CNT,	titani	a,	
Dioxins,PC composites, <b>Further Re</b>	Ils-Chemica Bs,PAHs an environmen cading To analyze tcomes: After comp 21. Disting 22. Unders	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical id endocrine disruptors and their Toxicity- Nano mater intal applications. and create a solution for environmental issues. pletion of the course, Student will be able to guish the chemistry involved stand the chemistry involved in water	ials, CNT,	titani	a,	
Dioxins,PC composites, Further Re	Ils-Chemica Bs,PAHs an , environmen eading To analyze tcomes: After comp 21. Disting 22. Unders 23. Identif	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical id endocrine disruptors and their Toxicity- Nano mater intal applications. e and create a solution for environmental issues. pletion of the course, Student will be able to guish the chemistry involved stand the chemistry involved in water y and solve the air pollution related issues	ials, CNT,	titani	a,	
Dioxins,PC composites, Further Re	eading To analyze After comj 21. Disting 22. Unders 23. Identif 24. Unders	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical id endocrine disruptors and their Toxicity- Nano mater- intal applications. and create a solution for environmental issues. bletion of the course, Student will be able to guish the chemistry involved stand the chemistry involved in water by and solve the air pollution related issues stand the soil related chemistry and issues	ials, CNT, Total:	titani	a, 45 He	ours
Dioxins,PC composites, <b>Further Re</b>	eading To analyze After comp 21. Disting 22. Unders 23. Identif 24. Unders 25. Identif	ental Chemicals I speciation –Speciation of Hg &As- Organic chemical id endocrine disruptors and their Toxicity- Nano mater intal applications. e and create a solution for environmental issues. pletion of the course, Student will be able to guish the chemistry involved stand the chemistry involved in water y and solve the air pollution related issues	ials, CNT, Total:	titani	a, 45 He	ours



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17EV103		ENVIRONMENTAL MICROBIC	DLOGY		T	P	<u>C</u>
	• .•			3	0	0	3
Course Ob		se provides a basic understanding	on microbiology	rolovont to	onvi	onmo	atal
		ing for candidates with little prior kr				omne	Ital
		phology, behavior and biochemisti			na vir	uses	and
		e outlined.	ly of bacteria, fail	igi, protoz	<i>Ju</i> , vii	uses,	unu
	<u> </u>	robiology of wastewater, sewage sl	udge and solid wa	aste treatm	ent pr	ocesse	s is
	also pr	vided. Aspects on nutrient removans are also covered.	•		-		
		sure to toxicology due to industrial	products and bypro	oducts are	also co	overed	
		rse provides a basic understanding					
		ing for candidates with little prior k					
Unit I	<b>Classificati</b>	n And Characteristics				5 Ho	urs
Classificati	on of microo	ganisms – prokaryotic, eukaryotic, co	ell structure, chara	cteristics, 1	Preserv	vation	of
microorgan		NA, replication, Recombinant DNA	technology.				
Unit II		<mark>nd Nutrient Cycles</mark>				10 Ho	urs
		nisms – Distribution / diversity of M					
		urface soil, Air – outdoor and Indoor				-	
		rchaebacteria – Significance in wate	11 1				
		iogeochemical cyclesHydrologi	cal - Nitrogen, Car	rbon, Phos	phorus	з,	
Sulphur, Cy		Micro Organism in nutrient cycle.				10.11	
TT 14 TTT		е в и и и и и и и и и и и и и и и и и и					
Unit III		of Microorganisms	1 1 1 4 4			<u>10 Ho</u>	
Nutrition a	nd metabolisr	in microorganisms, growth phases,			netabo	olism -	
Nutrition an respiration,	nd metabolisr aerobic and	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K	reb"s cycle, hexos	e monoph	netabo osphat	olism -	
Nutrition an respiration, pathway, el	nd metabolisr aerobic and ectron transp	in microorganisms, growth phases,	reb"s cycle, hexos	e monoph	netabo osphat	olism -	
Nutrition an respiration, pathway, el Bioenergeti	nd metabolisr aerobic and ectron transp ics.	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylatior	reb"s cycle, hexos	e monoph	netabo osphat ymes,	olism - e	-
Nutrition an respiration, pathway, el Bioenergeti <b>Unit IV</b>	nd metabolism aerobic and a lectron transp ics. Pathogens	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylation n Wastewater	reb"s cycle, hexos n, environmental fa	e monophe actors, enzy	netabo osphat ymes,	lism - e 10 Ho	-
Nutrition ar respiration, pathway, el Bioenergeti <b>Unit IV</b> Introduction	nd metabolism aerobic and lectron transp ics. Pathogens n to Water Bo	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylation Wastewater ne pathogens and Parasites and their	reb"s cycle, hexos n, environmental fa r effects on Humar	e monophe actors, enz	netabo osphat ymes,	lism - e <b>10 Ho</b> ant	urs
Nutrition ar respiration, pathway, el Bioenergeti <b>Unit IV</b> Introduction	nd metabolisr aerobic and ectron transp ics. Pathogens n to Water Bo nsmission of	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylation <b>Wastewater</b> ne pathogens and Parasites and their athogens – Bacterial, Viral, Protozoa	reb"s cycle, hexos n, environmental fa r effects on Humar an, and Helminths,	e monoph actors, enz n, Animal a Indicator	netabo osphat ymes, and Pla organi	lism - e 10 Ho ant sms o	urs f
Nutrition ar respiration, pathway, el Bioenergeti Unit IV Introduction health, Tran water – Col	nd metabolisr aerobic and a lectron transp ics. Pathogens n to Water Bo nsmission of p liforms	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylation <b>Wastewater</b> ne pathogens and Parasites and their athogens – Bacterial, Viral, Protozoa total coliforms, E-coli, Streptococcu	reb"s cycle, hexos n, environmental fa r effects on Humar an, and Helminths, us, Clostridium, Co	n, Animal a Indicator	netabo osphat ymes, and Pla organi n and	e e <b>10 Ho</b> ant sms o detect	urs f
Nutrition ar respiration, pathway, el Bioenergeti <b>Unit IV</b> Introduction health, Tran water – Col of virus. Co	nd metabolisr aerobic and a lectron transp ics. Pathogens n to Water Bo nsmission of liforms ontrol of micr	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylation <b>Wastewater</b> ne pathogens and Parasites and their athogens – Bacterial, Viral, Protozoa	reb"s cycle, hexos n, environmental fa r effects on Humar an, and Helminths, us, Clostridium, Co cal treatment proce	n, Animal a Indicator oncentratio	netabo osphat ymes, and Pla organi n and obic an	lism - e <b>10 Ho</b> ant sms o detect nd	urs f
Nutrition ar respiration, pathway, el Bioenergeti <b>Unit IV</b> Introduction health, Tran water – Col of virus. Co anaerobic,	nd metabolisr aerobic and a lectron transp ics. Pathogens n to Water Bonsmission of liforms ontrol of micr -oxidation,	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylation <b>Wastewater</b> ne pathogens and Parasites and their athogens – Bacterial, Viral, Protozoa total coliforms, E-coli, Streptococcu organisms; Microbiology of biologi	reb"s cycle, hexos n, environmental fa r effects on Humar an, and Helminths, us, Clostridium, Co cal treatment proce fication, eutrophica	n, Animal a Indicator oncentratio	netabo osphat ymes, and Pla organi n and obic an	lism - e <b>10 Ho</b> ant sms o detect nd	urs f
Nutrition ar respiration, pathway, el Bioenergeti <b>Unit IV</b> Introduction health, Tran water – Col of virus. Co anaerobic,	nd metabolisr aerobic and a lectron transp ics. Pathogens n to Water Bonsmission of liforms ontrol of micr -oxidation,	in microorganisms, growth phases, naerobic-fermentation, glycolysis, K rt system, oxidative phosphorylation <b>Wastewater</b> ne pathogens and Parasites and their athogens – Bacterial, Viral, Protozoa total coliforms, E-coli, Streptococcu organisms; Microbiology of biologi- oxidation, nitrification and de-nitrif	reb"s cycle, hexos n, environmental fa r effects on Humar an, and Helminths, us, Clostridium, Co cal treatment proce fication, eutrophica	n, Animal a Indicator oncentratio	netabo osphat ymes, and Pla organi n and obic an ients F	lism - e <b>10 Ho</b> ant sms o detect nd	urs f ion al
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Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

25. The candidate has the ability to conduct and test the toxicity due to various natural and synthetic products in the environment.

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17EV104		TRANSPORT OF WATER AND WASTEWATER	L	Т	P	С
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<b>Course Ob</b>	ojectives:					
	9. To edu	icate the students in detailed design concepts related to water	r trans	missi	on ma	ins,
		distribution system, sewer networks and storm water drain				
		cate the students in computer application on design.				
Unit I		lydraulics and Flow Measurement			8 He	
		low – continuity principle, energy principle and momentum pressure flow, minor heads losses, Carrying Capacity–Flow mea			etiona	1
Unit II	Water Tra	ansmission and Distribution			10 Ho	urs
networks E	Design, analy es – leak dete	inting, laying and maintenance, water hammer analysis; water sis and optimization – appurtenances – corrosion prevention – ction Storage reservoirs.				
Unit III	Wastewat				10 He	
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

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17EV105		PRINCIPLES AND DESIGN OF PHYSICO- CHEMICAL TREATMENT SYSTEMS	T	P	С
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Course Ob	iectives:			Ű	
		ucate the students on the principles and process designs of va	rious	treatr	nent
		ns for water and wastewater			
		ucate the students on design of treatment systems and the component	ents c	ompri	sing
		ystems, leading to the selection of specific process.		1	2
Unit I	Introduct			5 H	ours
Pollutants i	in water and	wastewater - characteristics, Standards for performance - Signific	ance	of phy	vsio
		Selection criteria-types of reactors- reactor selection-batch- co			
kinetics.					
Unit II	Treatmen	t Principles		10 Ho	ours
Physical tr	eatment - S	creening – Mixing, Equalization – Sedimentation – Filtration –	Eva	ooratio	on -
		sfer - mass transfer coefficient Adsorption - Isotherms - Membr			
		o filtration, ultra-filtration and hyper filtration electro dialysis			
stripping a	and crystalli	zation - Recent Advances. Principles of Chemical treatment	– Co	bagula	tior
flocculation	n – Precipit	ation - flotation solidification and stabilization - Disinfection,	Ion	excha	nge
Electrolytic	c methods, S	olvent extraction – advanced oxidation /reduction – Recent Trends			-
Unit III	<b>Design of</b>	Municipal Water Treatment Plants		10 Ho	
Flocculatio media Disi	n – clarifier nfection - D	<ul> <li>Design of municipal water treatment plant units – Aerators – che</li> <li>tube settling – filters – Rapid sand filters, slow sand filter, pres</li> <li>isplacement and gaseous type - Flow charts – Layouts – Hydrauli</li> </ul>	mical sure f c Pro	feedi filter, file, P	ng - dua ID -
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV106 ENVIRONMENTAL CHEMISTRY LABORATORY	T			
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Course Objectives:				
9. To train in the analysis of physical parameters of water and waster				
10. To train in the analysis of chemical parameters of water and waste	water			
List of Experiments:	0		~1	
21. Good Laboratory Practices, Quality control, calibration	of	(	Glassy	<u>vare</u>
	. 1 .	1. 1		
22. Sampling and Analysis of water (pH, alkalinity, hardness chloride, Sulphat	e, turbi			
nitrate, 12			fluo	nae)
23. Wastewater analysis (BOD, COD, Phosphate, TKN, Oil & Grease, Surfacta	nt and	hoory	1 mot	
12 12	in and	ncavy	y mei	a15).
	, SO2	and	NO	
09	l, <u>302</u>	anu		х )
25. Sampling and characterization of soil (CEC & SAR,	pН	21	nd	K).
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	To	tal	45 H	ours
	10	:	10 11	0415
Course Outcomes:	I	•		
After completion of the course, Student will be able to				
9. assess quality of environment				
10. conduct analysis on characteristics of water and waste water				
References:				
21. APHA, Standard Methods for the Examination of Water and Wastewater, 21st	Ed.			
22. Washington, 2005.				
25. Laboratory Manual for the Examination of Water, Wastewater soll Rump, H.H.	and Kris	st. H.		
23. Laboratory Manual for the Examination of water, wastewater soil Rump, H.H. a 24. Second Edition, VCH, Germany, 1992.	and Kris	st, H.		
24. Second Edition, VCH, Germany, 1992.			, L	ewis
24. Second Edition, VCH, Germany, 1992.		st, H. lition	, L	ewis
<ul><li>24. Second Edition, VCH, Germany, 1992.</li><li>25. Methods of air sampling &amp;analysis, JamesP.Lodge Jr(Editor)</li></ul>			, L	ewis
<ul><li>24. Second Edition, VCH, Germany, 1992.</li><li>25. Methods of air sampling &amp;analysis, JamesP.Lodge Jr(Editor)</li></ul>			, L	ewis C
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24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor)         publishers,Inc,USA,1989.         17EV107         ENVIRONMENTAL MICROBIOLOGY	3rd Eo	lition		r
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3         publishers,Inc,USA,1989.         17EV107         ENVIRONMENTAL MICROBIOLOGY         LABORATORY	Brd Ed	lition T	P	C
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor)         publishers,Inc,USA,1989.         17EV107         ENVIRONMENTAL MICROBIOLOGY	Brd Ed	lition T	P	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3         publishers,Inc,USA,1989.         17EV107         ENVIRONMENTAL MICROBIOLOGY LABORATORY         Course Objectives:         7. To train in the analysis of physical parameters of water and waster	Brd Ed L 0 water	lition T	P	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3         publishers,Inc,USA,1989.         17EV107         ENVIRONMENTAL MICROBIOLOGY         LABORATORY         Course Objectives:	Brd Ed L 0 water	lition T	P	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3 publishers,Inc,USA,1989. <b>ENVIRONMENTAL MICROBIOLOGY LABORATORY Course Objectives:</b> 7. To train in the analysis of physical parameters of water and waste v         8. To train in the analysis of chemical parameters of water and waste <b>List of Experiments:</b>	Brd Ed L 0 water	lition T	P	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3         publishers,Inc,USA,1989.         17EV107       ENVIRONMENTAL MICROBIOLOGY LABORATORY         Course Objectives:         7. To train in the analysis of physical parameters of water and waste 8. To train in the analysis of chemical parameters of water and waste         List of Experiments:         43. Preparation of culture media	Brd Ed L 0 water	lition T	P	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3 publishers,Inc,USA,1989.         17EV107       ENVIRONMENTAL MICROBIOLOGY LABORATORY         Course Objectives:       Image: Course of the	Brd Ed L 0 water	lition T	P	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3         publishers,Inc,USA,1989.         17EV107       ENVIRONMENTAL MICROBIOLOGY         LABORATORY         Course Objectives:         7. To train in the analysis of physical parameters of water and waster         8. To train in the analysis of chemical parameters of water and waste         List of Experiments:         43. Preparation of culture media	Brd Ed L 0 water	lition T	P	C
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3         publishers,Inc,USA,1989.         17EV107       ENVIRONMENTAL MICROBIOLOGY LABORATORY         Course Objectives:         7. To train in the analysis of physical parameters of water and waster 8. To train in the analysis of chemical parameters of water and waster         List of Experiments:         43. Preparation of culture media         44. Isolation, culturing and Identification of Microorganisms         45. Microorganisms from polluted habitats (soil, water and air)         46. Measurement of growth of microorganisms, Assay of enzymes involved in biot	Brd Ea L 0 water water ransforr	lition T 0	P 2	C
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3 publishers,Inc,USA,1989.         17EV107       ENVIRONMENTAL MICROBIOLOGY LABORATORY         7. To train in the analysis of physical parameters of water and waste v         8. To train in the analysis of chemical parameters of water and waste         43. Preparation of culture media         44. Isolation, culturing and Identification of Microorganisms         45. Microorganisms from polluted habitats (soil, water and air)         46. Measurement of growth of microorganisms, Assay of enzymes involved in biot         47. Biodegradation of organic matter in waste water Analysis of air borne microorganism	Brd Ea L 0 water water ransforr	lition T 0	P 2	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor) 3         publishers,Inc,USA,1989.         17EV107       ENVIRONMENTAL MICROBIOLOGY LABORATORY         Course Objectives:         7. To train in the analysis of physical parameters of water and waster 8. To train in the analysis of chemical parameters of water and waste         43. Preparation of culture media         44. Isolation, culturing and Identification of Microorganisms         45. Microorganisms from polluted habitats (soil, water and air)         46. Measurement of growth of microorganisms, Assay of enzymes involved in biot         47. Biodegradation of organic matter in waste water Analysis of air borne microorg         48. Staining of bacteria	Brd Ea L 0 water water ransforr	lition T 0	P 2	С
24. Second Edition, VCH, Germany, 1992.         25. Methods of air sampling &analysis, JamesP.Lodge Jr(Editor)         publishers,Inc,USA,1989.         17EV107       ENVIRONMENTAL MICROBIOLOGY LABORATORY         7. To train in the analysis of physical parameters of water and waster 8. To train in the analysis of chemical parameters of water and waster         43. Preparation of culture media         44. Isolation, culturing and Identification of Microorganisms         45. Microorganisms from polluted habitats (soil, water and air)         46. Measurement of growth of microorganisms, Assay of enzymes involved in biot         47. Biodegradation of organic matter in waste water Analysis of air borne microorg         48. Staining of bacteria         49. Effect of pH, temperature on microbial growth	Brd Ea L 0 water water ransforr	lition T 0	P 2	С
<ul> <li>24. Second Edition, VCH, Germany, 1992.</li> <li>25. Methods of air sampling &amp;analysis, JamesP.Lodge Jr(Editor) 3 publishers, Inc, USA, 1989.</li> <li>17EV107 <ul> <li>ENVIRONMENTAL MICROBIOLOGY LABORATORY</li> </ul> </li> <li>Course Objectives: <ul> <li>7. To train in the analysis of physical parameters of water and waster 8. To train in the analysis of chemical parameters of water and waster 43. Preparation of culture media</li> <li>44. Isolation, culturing and Identification of Microorganisms</li> <li>45. Microorganisms from polluted habitats (soil, water and air)</li> <li>46. Measurement of growth of microorganisms, Assay of enzymes involved in biot 47. Biodegradation of organic matter in waste water Analysis of air borne microorg</li> </ul> </li> </ul>	Brd Ea L 0 water water ransforr	lition T 0	P 2	С
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<ul> <li>24. Second Edition, VCH, Germany, 1992.</li> <li>25. Methods of air sampling &amp;analysis, JamesP.Lodge Jr(Editor) 3 publishers, Inc, USA, 1989.</li> <li>17EV107 <ul> <li>ENVIRONMENTAL MICROBIOLOGY LABORATORY</li> </ul> </li> <li>Course Objectives: <ul> <li>7. To train in the analysis of physical parameters of water and waste video and vi</li></ul></li></ul>	Brd Ea L 0 water water ransforr ganisms	lition T 0	P 2	C



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

55. Detection of Anaerobic bacteria (Clostridium sp.)		
56. Bioreactors		
	Total	45 Hours
	:	
Course Outcomes:		
After completion of the course, Student will be able to		
7. Field oriented testing of water, wastewater and solid waste for microb	oial conta	mination.
8. Perform toxicity test.		
References:		
10. Standard methods for the examination of water and wastewater, American Public	Health A	Association
(21st edition) 2005.		
11. Charles Gerba, Environmental Microbiology: A laboratory man	ual, Else	vier
Publications, 2012.		
12. Christon J. Hurst, Ronald L. Crawford, Jay L. Garland, David A. Lipson, Aaron	L. Mills,	and Linda
D. Stetzenbach, Manual of Environmental Microbiology, 3rd Edition, ASM Press,	2007.	



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Course Ob																	
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	for water a	and w	astewat	er and st	stude	ents sl	shoul	ld gai	n con	npet	ency in	n th	e proc	ess	emplo	oyed	n
	design of the	treatm	nent syst	tems and	d the	e com	npor	nents	comp	orisir	ig such	h sy	stems	lea	ding t	to the	
	selection of	of spee	cific pro	ocess.													
Unit I	<b>Introducti</b>	tion														10 H	ours
-	of biological							-									etics
of biologic	al growth – F	Factor	rs affect	ting grov	wth -	– atta	tache	d and	l susp	bend	ed gro	wth	- Det	ermi	natio	<mark>n of</mark>	
Kinetic coe	efficients for	organ	nics rem	10val – I	<b>Biod</b>	legra	adabi	lity a	ssessi	men	t-sele	ctio	n of p	oce	ss- re	actor	s-
batch-conti	nuous type.																
Unit II	A anabia T	Freatr	mont of	Waster	wate											10 H	0.11.14
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	out, PID, hyd						on	unspe	Jour o	Puo	10 10	, e i ui	inacioi			• 1	10
Unit III	Anaerobic		-													10 H	our
	nd suspended							3, up	flow	filte	rs, Flu	idiz	ed be	ls M			
	sposal – Nuti																
Unit IV	Sludge Tro															5 H	
Design of s	sludge manag	geme	nt facili	ties, slue	dge t	thick	cenir	ıg, slı	ıdge o	dige	stion,	biog	as gei	nera	tion,	sludg	e
	(mechanical					D, hy	ydra	ulics	profil	le - 1	ıpgrac	ling	existi	ng p	lants	-	
	sidue disposa																
Unit V	<b>Construct</b>															10 H	our
controlling	on and Opera of plant oper agement fact	eratior	ns – cap														ts –
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Course Ou																	
	After comp																
		<b>-</b>	-	l schema		-					treatn	nent	ofwa	istev	vater		
	10. Transla	late pe	ertinent	criteria	into	syste	tem r	equir	emen	nts.							
References																	
2000.	ala, S.J., Wa																
	l on "Sewe ment of Indi					eatme	ent"	CPH	IEEC	), N	linistr	ус	f Ur	oan	Dev	elopn	nent
19. Metcal	f & Eddy, II Hill Publishir	INC, ,	"Waster	water E	ngin					t an	d Reu	se, 1	Fourtl	Ed	ition,	Tata	M
20. F.R. Sj	pellman, Har 2009).	ind Bo	ook of '	Water a	ind V	Waste	ewat	ter Tr	eatm	ent	Plant o	oper	ations	, CI	RC Pi	ress,	Nev



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		AIR POLLUTION MONITORI	NG AND CONTRO	DL L	T	Р	С
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Course Ob							
	-	nowledge on the principles and des	ign of control of ind	loor/particu	late/g	aseou	s
	-	and its emerging trends					
Unit I	Introduct					7 H	our
		n of Atmosphere – Sources and cla					
1			laterials & Structure				
		nere, Soil & Water bodies – Long-					
		Ambient Air Quality and Emission				Emissi	on
Inventories	s – Ambient	d Stack Sampling and Analysis of	Particulate and Gas	eous Polluta	ants.		
Unit II	Air Pollut	n Modelling				5 H	
		n Air Pollution - Fundamentals, At	mospheric stability	Inversion	Wind		
		Transport & Dispersion of Air Po					03
	Climatology.		induines into defining	reeninque	, 111		
Unit III		Particulate Contaminants				11 He	our
Factors aff		n of Control Equipment – Gas Par	ticle Interaction, – V	Vorking pri			
		ns of Gravity Separators (cyclone)					0
Particulate	Scrubbers, I	ectrostatic Precipitators - Operatio	nal Considerations -	Process Co	ontrol	and	
Monitoring	Casting			1			
	g – Costing c	APC equipment – Case studies for	stationary and mob	lle sources.			
Unit IV	Control o	Gaseous Contaminants	•			11 Ho	
Unit IV Factors aff	Control o	<mark>Gaseous Contaminants</mark> n of Control Equipment – Workin	g principle, Design a	and perform	ance	equat	
Unit IV Factors aff of absorpti	Control o ecting Select on, Adsorpti	<mark>Gaseous Contaminants</mark> n of Control Equipment – Workin n, condensation, Incineration, Bio s	g principle, Design a crubbers, Bio filters	and perform – Process o	ance	equat	ion
Unit IV Factors aff of absorption	Control o ecting Select on, Adsorpti g - Operation	<mark>Gaseous Contaminants</mark> n of Control Equipment – Workin	g principle, Design a crubbers, Bio filters	and perform – Process o	ance	equat	ion
Unit IV Factors aff of absorption Monitoring mobile sou	Control o ecting Select on, Adsorpti g - Operation rcces.	Gaseous Contaminants n of Control Equipment – Workin n, condensation, Incineration, Bio s Considerations - Costing of APC	g principle, Design a crubbers, Bio filters	and perform – Process o	ance contro ation	equat ol and ary an	ion d
Unit IV Factors affe of absorption Monitoring mobile sou Unit V	Control o ecting Select on, Adsorpti g - Operation prces. Indoor Ai	Gaseous Contaminants n of Control Equipment – Workin n, condensation, Incineration, Bio s Considerations - Costing of APC Quality Management	g principle, Design a crubbers, Bio filters Equipment – Case s	and perform - Process of tudies for st	ance contro	equat ol and ary an 11 Ho	ion d our
Unit IV Factors aff of absorpti Monitoring mobile sou Unit V Sources typ	Control o ecting Select on, Adsorpti g - Operation rcces. Indoor Ai pes and cont	Gaseous Contaminants n of Control Equipment – Workin n, condensation, Incineration, Bio s Considerations - Costing of APC Quality Management l of indoor air pollutants, sick build	g principle, Design a crubbers, Bio filters Equipment – Case s ling syndrome types	and perform - Process of tudies for st - Radon P	ance contro ationation ollution	equat ol and ary an <b>11 H</b> o on and	ion d our
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NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Course Objectives:       To impart knowledge on the concept and application of Industrial pollution prevention, cleaner technologies, industrial wastewater treatment and residue management.         Unit I       Introduction       8 Hour         Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial wastewater monitoring and sampling -generation rates, characterization and variables – Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.         Unit II       Industrial Pollution Prevention & Waste Minimisation       8 Hour         Prevention and Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Programs in Industries.       10 Hour         Prevention Programs in Industries.       10 Hour         Prevention Programs in Industries.       10 Hour         Prevention Programs in Industries.       9 Hour         Unit II       Industrial Wastewater Treatment       10 Hour         Flow and Load Equalization – Solids Separation – Removal of Fats, Oil & Grease - Neutralization – Removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation	17EV203	IND	USTRIAL WASTE	MANAGEMENT		L	Т	Р	C
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Unit II       Industrial Pollution Prevention & Waste Minimisation       8 Hour         Prevention and Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy -       Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution         Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution       Prevention Programs in Industries.         Unit III       Industrial Wastewater Treatment       10 Hour         Flow and Load Equalization – Solids Separation – Removal of Fats, Oil & Grease- Neutralization –       Removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous         removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous       removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced         Oxidation processes – Treatability Studies.       9 Hour         Individual and Common Effluent Treatment Plants – Joint treatment of industrial materia       9 Hour         Individual and Common Effluent Treatment Plants – Joint treatment of industrial wastewater       reatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.       10 Hour         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       10 Hour	variables –	Foxicity of indust	rial effluents and Bioa	ssay tests – Major issu	es on water q	uality	<mark>7</mark>		
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Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution         Prevention Programs in Industries.         Unit III       Industrial Wastewater Treatment         Flow and Load Equalization – Solids Separation – Removal of Fats, Oil & Grease- Neutralization –         Removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous         removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of         Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced         Oxidation processes – Treatability Studies.         Unit IV       Wastewater Reuse and Residual Management         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic         wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial         reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater         treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.         Unit V       Case Studies         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries         Course Outcomes:       Total:       45 Houre									
Prevention Programs in Industries.       10 Hours         Unit III       Industrial Wastewater Treatment       10 Hours         Flow and Load Equalization – Solids Separation – Removal of Fats, Oil & Grease- Neutralization –       Removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous         removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced       Oxidation processes – Treatability Studies.         Unit IV       Wastewater Reuse and Residual Management       9 Hours         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic       wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial         reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater       treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.       10 Hours         Unit V       Case Studies       10 Hours         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       10 Hours         Course Outcomes:									
Unit III       Industrial Wastewater Treatment       10 Hour         Flow and Load Equalization – Solids Separation – Removal of Fats, Oil & Grease- Neutralization –       Removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous         removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced       Oxidation processes – Treatability Studies.         Unit IV       Wastewater Reuse and Residual Management       9 Hours         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic       wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial         reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater       treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.       10 Hours         Unit V       Case Studies       10 Hours         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries         Course Outcomes:				1 1	U	U			
Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous         removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of         Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced         Oxidation processes – Treatability Studies.         Unit IV       Wastewater Reuse and Residual Management       9 Hour         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic       wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial         reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater       treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.       10 Hour         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       Total:       45 Hour         Course Outcomes:								10 He	our
Removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous         removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of         Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced         Oxidation processes – Treatability Studies.         Unit IV       Wastewater Reuse and Residual Management         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic         wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial         reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater         treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering         and disposal of sludge – Management of RO rejects.         Unit V       Case Studies         Industrial manufacturing process description, wastewater characteristics, source reduction options and         waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining –         Pharmaceuticals – Sugar and Distilleries         Course Outcomes:	Flow and L	oad Equalization	- Solids Separation - I	Removal of Fats, Oil &	& Grease- Ne	utrali	zatio	n –	
removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies. Unit IV Wastewater Reuse and Residual Management 9 Hour Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects. Unit V Case Studies 10 Hour Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries Course Outcomes: After completion of the course, Student will be able to 17. Define the Principles of pollution prevention and mechanism of oxidation processes. 18. Suggest the suitable technologies for the treatment of wastewater. 19. Discuss about the wastewater characteristics	Removal of	Inorganic Consti	tuents – Precipitation.	Heavy metal removal	Nitrogen &	Phos	phor	ous	
Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced         Oxidation processes – Treatability Studies.         Unit IV       Wastewater Reuse and Residual Management       9 Hours         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic       wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse, Present status and issues - Disposal on water and land – Residuals of industrial wastewater       treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.       10 Hours         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       Total:       45 Hours         Course Outcomes:		-	-	-	-		-		
Oxidation processes – Treatability Studies.       9 Hour:         Unit IV       Wastewater Reuse and Residual Management       9 Hour:         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic       wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse, Present status and issues - Disposal on water and land – Residuals of industrial wastewater       Industrial reuse, Present status and issues - Disposal on water and land – Residuals of industrial wastewater         treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.       10 Hour:         Unit V       Case Studies       10 Hour:         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       Total:       45 Hour:         Course Outcomes:		-	-		-				
Unit IV       Wastewater Reuse and Residual Management       9 Hour:         Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic       wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial         reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater       treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.       10 Hour:         Unit V       Case Studies       10 Hour:         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       45 Hour:         Course Outcomes:				,		,			
Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects. Unit V Case Studies 10 Hours Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries Course Outcomes: After completion of the course, Student will be able to 17. Define the Principles of pollution prevention and mechanism of oxidation processes. 18. Suggest the suitable technologies for the treatment of wastewater. 19. Discuss about the wastewater characteristics				nagement				9 H	ours
reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects. Unit V Case Studies 10 Hours Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries Total: 45 Hours Course Outcomes: After completion of the course, Student will be able to 17. Define the Principles of pollution prevention and mechanism of oxidation processes. 18. Suggest the suitable technologies for the treatment of wastewater. 19. Discuss about the wastewater characteristics					dustrial and o	lomes	stic		
reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects. Unit V Case Studies 10 Hours Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries Total: 45 Hours Course Outcomes: After completion of the course, Student will be able to 17. Define the Principles of pollution prevention and mechanism of oxidation processes. 18. Suggest the suitable technologies for the treatment of wastewater. 19. Discuss about the wastewater characteristics	wastewater	- Zero effluent di	scharge systems - Qua	lity requirements for V	Wastewater re	euse –	Indu	ıstrial	Ĺ
treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects. Unit V Case Studies 10 Hours Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries Total: 45 Hours Course Outcomes: After completion of the course, Student will be able to 17. Define the Principles of pollution prevention and mechanism of oxidation processes. 18. Suggest the suitable technologies for the treatment of wastewater. 19. Discuss about the wastewater characteristics									
and disposal of sludge – Management of RO rejects.       10 Hours         Unit V       Case Studies       10 Hours         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       Total:       45 Hours         Course Outcomes:			-						ring
Unit V       Case Studies       10 Hours         Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries       Total:       45 Hours         Course Outcomes:					<i>,</i>		U,		
Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries         Total: 45 Hours         Course Outcomes:         After completion of the course, Student will be able to         17. Define the Principles of pollution prevention and mechanism of oxidation processes.         18. Suggest the suitable technologies for the treatment of wastewater.         19. Discuss about the wastewater characteristics	Unit V		5 5					10 H	ours
waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries           Total:         45 Hourse           Course Outcomes:	Industrial n	nanufacturing pro	cess description, waste	water characteristics,	source reduct	ion o			
Total: 45 Hours         Total: 45 Hours         Course Outcomes:         After completion of the course, Student will be able to         17. Define the Principles of pollution prevention and mechanism of oxidation processes.         18. Suggest the suitable technologies for the treatment of wastewater.         19. Discuss about the wastewater characteristics		• •	- ·						
Total: 45 Hours         Course Outcomes:         After completion of the course, Student will be able to         17. Define the Principles of pollution prevention and mechanism of oxidation processes.         18. Suggest the suitable technologies for the treatment of wastewater.         19. Discuss about the wastewater characteristics				1 1 1	0			0	
Course Outcomes:         After completion of the course, Student will be able to           17. Define the Principles of pollution prevention and mechanism of oxidation processes.           18. Suggest the suitable technologies for the treatment of wastewater.           19. Discuss about the wastewater characteristics		8							
After completion of the course, Student will be able to         17. Define the Principles of pollution prevention and mechanism of oxidation processes.         18. Suggest the suitable technologies for the treatment of wastewater.         19. Discuss about the wastewater characteristics					Tota	al:		45 He	ours
<ul> <li>17. Define the Principles of pollution prevention and mechanism of oxidation processes.</li> <li>18. Suggest the suitable technologies for the treatment of wastewater.</li> <li>19. Discuss about the wastewater characteristics</li> </ul>	Course Ou								
18. Suggest the suitable technologies for the treatment of wastewater.         19. Discuss about the wastewater characteristics		-							
19. Discuss about the wastewater characteristics						tion p	oroce	esses.	
		18. Suggest the	suitable technologies f	or the treatment of wa	stewater.				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV204		SOLID AND HAZARDOUS WASTE MANAGEMENT	L	Т	Р	С
			3	0	0	3
<b>Course Ob</b>	ojectives:					
	To impart	knowledge and skills in the collection, storage, transport, treatr	nent,	dispo	osal a	ıd
	recycling of	options for solid wastes including the related engineering princi	iples,	desig	gn	
	criteria, m	ethods and equipment.				
Unit I	Sources, (	Classification and Regulatory Framework			9 H	ours
Types and	Sources of s	solid and hazardous wastes - Need for solid and hazardous wa	aste n	nanag	gemer	nt
Salient feat	tures of India	an legislations on management and handling of municipal soli	d was	stes, l	nazaro	lous
wastes, bic	omedical was	stes, nuclear wastes - lead acid batteries, electronic wastes, pl	lastics	s and	fly a	sh –
Elements of	of integrated	d waste management and roles of stakeholders - Financing	and	Publi	ic Pri	vate
	-	management.				
Unit II		aracterization and Source Reduction			<u>8 Ho</u>	
		and variation - Composition, physical, chemical and biologica				
		haracteristics – TCLP tests – waste sampling and characteriz		-	- So	urce
		Vaste exchange - Extended producer responsibility - Recycling a	and re		0 TT	
Unit III		Collection and Transport Of Wastes	• 1		9 Hoi	
		tion of wastes at source – storage and collection of munic				
•		systems - Need for transfer and transport – Transfer station	-		•	
and transpo		ty, storage, labeling and handling of hazardous wastes – hazard	.ous w	vasie	mann	ests
Unit IV		ocessing Technologies			10 He	nire
		processing – material separation and processing technologie	<u>s</u> _ '			
		technologies – methods and controls of Composting -				
		y recovery – incineration – solidification and stabilization of				
-	-	wastes - Health considerations in the context of operation of				
		t of outputs on the environment.	1 Iaci	innes,	nanc	mg
Unit V	Waste Dis				9 Hot	
		– Disposal in landfills - Landfill Classification, types and met	hode			
		of sanitary landfills, secure landfills and landfill bioreactors – 1				
		adfill closure and environmental monitoring – Rehabilitation				
landfill ren		tann crosure and chynolmichar montornig - rendomator	1 01 1	open	dam	,0
					45 TT	
Course Or		Tot:	al:		45 H	ours
Course Ou		pletion of the course, Student will be able to				
			daman	weata		tha
		stand the characteristics of different types of solid and hazard s affecting variation	JOUS	waste	s and	ıne
		e and explain important concepts in the field of solid wast	te mo	nage	ment	and
		st suitable technical solutions for treatment of municipal and ind				anu
		stand the role legislation and policy drivers play in stakehold				the
		and apply the basic scientific principles for solving practical				
	challer		wasi	C ma	nagei	
	chanter	1200				



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

17EV205		ENVIRONMENTAL IMPACT ASSESSMENT	L	Т	Р	С
			3	0	0	3
Course Ob						
		pose the students to the need, methodology, documentation				
	enviro	nmental impact assessment and to develop the skill to pre-	pare	envir	onme	ntal
	manag	gement plan.				
	10. To pr	ovide knowledge related to the broad field of environment	tal ris	sk ass	sessm	ent
	import	tant processes that control contaminant transport and tools t	that c	an be	e use	1 in
	predic	ting and managing human health risks.				
Unit I	Introduct	ion			8 Ho	ours
Historical (	development	of Environmental Impact Assessment (EIA). EIA in Project Cy	ycle. l	Legal	and	
Regulatory	y aspects in I	ndia. – Types and limitations of EIA –.EIA process- screening -	- scop	oing -	setti	ıg –
analysis – r	mitigation. C	Cross sectoral issues and terms of reference in EIA – Public Part	ticipat	tion i	n EIA	
TT 1/ TT					10.11	
Unit II		entification and Prediction	0		<u>10 Ho</u>	
		Checklists – Cost benefit analysis – Analysis of alternatives – S				es
$10^{\circ} EIA = I$				a o o t m		
		ns in EIA. Prediction tools for EIA – Mathematical modeling for				
- Assessm	ent of impac	ts – air – water – soil – noise – biological — Cumulative Impac			ent.	tion
– Assessme Unit III	ent of impact	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation	et Ass	essmo		tion
– Assessme Unit III Social imp	ent of impact Social Imp act assessme	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu	t Ass nity a	essme	ent. 8 Ho	tion ours
– Assessme Unit III Social imp institutiona	ent of impact Social Impact bact assessme al arrangement	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit	nity a tion I	essme and Docur	ent. 8 Ho	tion ours
– Assessme Unit III Social imp institutiona of EIA find	ent of impact Social Imp pact assessme al arrangement dings – plann	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu	nity a tion I	essme and Docur	ent. 8 Ho	tion ours
- Assessme Unit III Social imp institutiona of EIA find preparation	ent of impact Social Imp pact assessme al arrangement dings – plann n.	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit ning – organization of information and visual display materials	nity a tion I	essme and Docur	ent. 8 Ho nenta	urs tion
- Assessme Unit III Social imp institutiona of EIA find preparation Unit IV	ent of impact Social Import oact assessme al arrangement dings – plann n. Environm	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transi- ning – organization of information and visual display materials - mental Management Plan	nity a tion I – Rep	essmo and Docur port	ent. 8 Ho	tion ours
<ul> <li>Assessme</li> <li>Unit III</li> <li>Social imp institutiona of EIA find preparation</li> <li>Unit IV</li> <li>Environme</li> </ul>	ent of impact Social Import at assessme at arrangement dings – plann n. Environmental Manage	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit ning – organization of information and visual display materials – mental Management Plan ement Plan - preparation, implementation and review – Mitigation	nity a tion I – Rep	and Docur Dort	ent. 8 Ho nenta 7 Ho	tion tion
– Assessme Unit III Social imp institutiona of EIA find preparation Unit IV Environme Rehabilitat	ent of impact Social Imp pact assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit- ning – organization of information and visual display materials – mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes	nity a tion I – Rep	and Docur Dort	ent. 8 Ho nenta 7 Ho	tion tion
– Assessme Unit III Social imp institutiona of EIA find preparation Unit IV Environme Rehabilitat	ent of impact Social Imp pact assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I und Quality as	ts – air – water – soil – noise – biological — Cumulative Impact pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit- ning – organization of information and visual display materials - mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes spects of Environmental Impact Assessment- Case Studies.	nity a tion I – Rep	and Docur oort d st pro	ent. 8 Ho nenta 7 Ho	tion tion ours
<ul> <li>Assessme</li> <li>Unit III</li> <li>Social imp institutiona of EIA find preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> </ul>	ent of impact Social Import act assessment al arrangement dings – plann n. Environm ental Manage tion Plans – I and Quality as Environm	ts – air – water – soil – noise – biological — Cumulative Impac pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit- ning – organization of information and visual display materials – mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes	t Assumity a strong tion I - Rep	essme and Docur oort d st pro	ent. 8 Ho nenta 7 Ho ject a 12 Ho	tion ours tion ours udit
<ul> <li>Assessme</li> <li>Unit III</li> <li>Social imp institutiona of EIA find preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> </ul>	ent of impact Social Imp pact assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I and Quality as Environm ental risk asse	ts – air – water – soil – noise – biological — Cumulative Impact pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit- ning – organization of information and visual display materials – mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management	et Asse unity a tion I – Rep on an – Pos	essme and Docur oort d st pro	ent. 8 Ho nenta 7 Ho ject a 12 Ho xposu	tion tion udit
<ul> <li>Assessme</li> <li>Unit III</li> <li>Social imp</li> <li>institutiona</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> <li>Assessmen</li> </ul>	ent of impact Social Imp pact assessme al arrangement dings – plann n. Environm ental Manage tion Plans – I and Quality as Environm ental risk asse at – Exposure	ts – air – water – soil – noise – biological — Cumulative Impact pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transi- ning – organization of information and visual display materials - mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management essment framework-Hazard identification -Dose Response Eval	tion I – Rep on an – Pos	essme and Docur oort d st pro n – E EMA	ent. 8 Ho menta 7 Ho ject a 12 Ho xposu	tion ours tion ours udit
<ul> <li>Assessmer</li> <li>Unit III</li> <li>Social implication</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> <li>Assessmen</li> <li>methods –</li> </ul>	ent of impact Social Import act assessme al arrangement dings – plann n. Environmental Manage tion Plans – I and Quality as Environmental risk asses at – Exposure Event tree an	ts – air – water – soil – noise – biological — Cumulative Impact pact Assessment and EIA Documentation ent - Relationship between social impacts and change in communities. Individual and family level impacts. Communities in transition ing – organization of information and visual display materials – mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management essment framework-Hazard identification -Dose Response Eval e Factors, Tools for Environmental Risk Assessment– HAZOP a	et Asse inity a tion I – Rep on an – Pos luation and F mode	essme and Docur oort d st pro EMA eling o	ent. 8 Ho menta 7 Ho ject a 12 Ho xposu	tion ours tion ours udit
<ul> <li>Assessmer</li> <li>Unit III</li> <li>Social implication</li> <li>of EIA find</li> <li>preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical at</li> <li>Unit V</li> <li>Environme</li> <li>Assessmen</li> <li>methods –</li> <li>contamination</li> </ul>	ent of impact Social Import act assessme al arrangement dings – plann n. Environmental Manage tion Plans – I and Quality as Environmental risk asses at – Exposure Event tree an	ts – air – water – soil – noise – biological — Cumulative Impact pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit- ning – organization of information and visual display materials – mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management essment framework-Hazard identification -Dose Response Eval te Factors, Tools for Environmental Risk Assessment– HAZOP and fault tree analysis – Multimedia and multipathway exposure racterization Risk communication - Emergency Preparedness Plane Particular Assess Plane - Emergency Preparedness Plane Particular - Particular - Parti	et Asse inity a tion I – Rep on an – Pos luation and F mode	essme and Docur oort d st pro EMA eling o	ent. 8 Ho menta 7 Ho ject a 12 Ho xposu	tion ours tion ours udit ours
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<ul> <li>Assessmer</li> <li>Unit III</li> <li>Social imp institutional of EIA find preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> <li>Assessmen</li> <li>methods –</li> <li>contaminant</li> <li>manageme</li> </ul>	ent of impact Social Import act assessme al arrangement dings – plann n. Environmental Manage tion Plans – I and Quality as Environmental risk asses at – Exposure Event tree an nt- Risk Char ent programs. After comp	ts – air – water – soil – noise – biological — Cumulative Impact pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit- ning – organization of information and visual display materials – ment Plan - preparation, implementation and review – Mitigatic Policy and guidelines for planning and monitoring programmes spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management essment framework-Hazard identification -Dose Response Eval e Factors, Tools for Environmental Risk Assessment– HAZOP and fault tree analysis – Multimedia and multipathway exposure racterization Risk communication - Emergency Preparedness Plan pletion of the course, Student will be able to	et Ass inity a tion I – Rep on and – Pos luation and F mode lans – al:	essme and Docur oort d st pro EMA eling o Desig	ent. 8 Ho menta 7 Ho ject a 12 Ho of gn of 45 Ho	tion ours tion ours udit risk
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<ul> <li>Assessmer</li> <li>Unit III</li> <li>Social imp institutiona of EIA find preparation</li> <li>Unit IV</li> <li>Environme</li> <li>Rehabilitat</li> <li>Ethical a</li> <li>Unit V</li> <li>Environme</li> <li>Assessmen</li> <li>methods –</li> <li>contaminan</li> <li>manageme</li> </ul>	ent of impact Social Import act assessme al arrangement dings – plann n. Environmental Manage tion Plans – I and Quality as Environmental risk asse at – Exposure Event tree and ant programs. utcomes: After comp 9. Under indust	ts – air – water – soil – noise – biological — Cumulative Impact pact Assessment and EIA Documentation ent - Relationship between social impacts and change in commu- nts. Individual and family level impacts. Communities in transit- ning – organization of information and visual display materials - mental Management Plan ement Plan - preparation, implementation and review – Mitigation Policy and guidelines for planning and monitoring programmes spects of Environmental Impact Assessment- Case Studies. mental Risk Assessment and Management essment framework-Hazard identification -Dose Response Eval te Factors, Tools for Environmental Risk Assessment – HAZOP and fault tree analysis – Multimedia and multipathway exposure racterization Risk communication - Emergency Preparedness Plan- mental function of the course, Student will be able to stand the necessity to study the impacts and risks that will be case the factor of the course of the stand the material for the stand for th	et Ass inity a tion I – Rep on and – Pos luation and F mode lans – <b>al:</b>	and Docur oort d st pro EMA eling o Desig	ent. 8 Ho nenta 7 Ho ject a 12 Ho xposu of gn of 45 Ho roject	tion tion udit ours tre risk



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV206		UNIT OPERATIONS AND PROCESSES I LABORATORY	LI	Γ	Р	С
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Course Ob	jectives:	· · · ·				
		evelop the skill for conducting Treatability studies of water				ater
		ent by various Unit Operations and Processes using laboratory sca				
		evelop the skill for conducting Treatability studies of water				ater
		ent by various Unit Operations and Processes using laboratory sca	ale mo	ode	els.	
List of Exp						
	ation and Fl			7		
	studies on se	<u>v</u>		10		
		n- Characteristics of Filter media		7		
44. Water s	softening					
-	tion studies	Kinetics				
7 46 Deven	o Ocmocia	Silt Density Index				
40. Kevers 7	e Osmosis-	Shi Density Index				
$\frac{7}{17}$ Kinetic	es of suspend		dev			
		led growth process lactivated sludge processi. Sludge volume ind				
	s of suspend	led growth process (activated sludge process)- Sludge volume Ind	uca			
<mark>14</mark>	1		uca			
<mark>14</mark>	1	systems / kinetics (Demonstration)				
14 48. Anaero 10	bic Reactor					
14 48. Anaero 10	bic Reactor	systems / kinetics (Demonstration)	<u></u>			
14 48. Anaero 10 49. Advano 14	bic Reactor	systems / kinetics (Demonstration)	<u></u>			
14 48. Anaero 10 49. Advano 14	bic Reactor	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis)				
14           48.         Anaero           10         10           49.         Advand           14         14           50.         Disinfed	bic Reactor	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water	Total		45 Ho	ours
14           48. Anaero           10           49. Advano           14           50. Disinfe           7	bic Reactor ced Oxidatic	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water			45 Ho	ours
14           48.         Anaero           10         10           49.         Advand           14         14           50.         Disinfed	bic Reactor ced Oxidatic ection for Dr	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water		2	45 Ho	ours
14           48. Anaero           10           49. Advano           14           50. Disinfe           7	bic Reactor ced Oxidatic ection for Dr ttcomes:	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water pletion of the course, Student will be able to			45 Ho	DURS
14           48. Anaero           10           49. Advano           14           50. Disinfe           7	bic Reactor ced Oxidatic ection for Dr tcomes: After com 9. Condu	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water pletion of the course, Student will be able to net treatability studies for water and waste water treatment.		2	45 Ho	DURS
1448. Anaero1049. Advano1450. Disinfe7Course Ou	bic Reactor ced Oxidatic ection for Dr atcomes: After com 9. Condu 10. Design	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water pletion of the course, Student will be able to			45 Ho	burs
14         48. Anaero         10         49. Advano         14         50. Disinfe         7         Course Ou         References	bic Reactor ced Oxidatic ection for Dr atcomes: After com 9. Condu 10. Design	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water  pletion of the course, Student will be able to ict treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes.	Total :			
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14         48. Anaero         10         49. Advano         14         50. Disinfe         7         Course Ou         References         17. Metcal         Tata M         18. Lee, C	bic Reactor ced Oxidatic ection for Dr atcomes: After com 9. Condu 10. Design s: f and Eddy. cGraw Hill .C. and Shu	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water  pletion of the course, Student will be able to net treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes.  . Inc. "Wastewater Engineering, Treatment, Disposal and Reuse	Total : se, Th	nird	l Edit	ion
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14         48. Anaero         10         49. Advano         14         50. Disinfe         7         Course Ou         References         17. Metcal         Tata M         18. Lee, C         New Y	bic Reactor ced Oxidatic ection for Dr atcomes: After com 9. Condu 10. Design f and Eddy. CGraw Hill .C. and Shu ork, 1999.	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water  pletion of the course, Student will be able to net treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes.  Inc. "Wastewater Engineering, Treatment, Disposal and Reuse Publishing Company Limited, New Delhi, 2003.	Total : se, Th	iird	l Edit raw I	ion Hill
14         48. Anaero         10         49. Advance         14         50. Disinfer         7         Course Ou         References         17. Metcal         Tata M         18. Lee, C         New Y         19. Casey	bic Reactor ced Oxidatic ection for Dr atcomes: After com 9. Condu 10. Design f and Eddy. CGraw Hill .C. and Shu ork, 1999.	systems / kinetics (Demonstration) on Processes – (Ozonation, Photocatalysis) inking water  pletion of the course, Student will be able to text treatability studies for water and waste water treatment. n laboratory models for various unit operations and processes.  . Inc. "Wastewater Engineering, Treatment, Disposal and Reuse Publishing Company Limited, New Delhi, 2003. n dar Lin. Handbook of Environmental Engineering Calculations	Total : se, Th	iird	l Edit raw I	ion Hill
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NAGAPATTINAM - 611 002. TAMILNADU, INDIA

17EV001		MODELING	L	Т	Р	С
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Course Ob	To introdu	ce the emerging concepts of climate modeling and projecting futu derstand data analysis and application.	ure	clima	ite	
Unit I	-	ric Pollution			9 H	ours
particles, e	ic Pollution, mission inve	type of pollutants, gaseous and particulate pollutants, size of atmo ntory, various sources of emissions, bio-mass burning, pollution f and Acid Deposition Industrial pollution.				
Unit II	<b>Meteorolo</b>	gy			9 H	ours
meteorolog how it cont	gical factors t tributes to se	gy: sources of air pollution, methods for air pollution measurement hat contribute to air quality degradation, basic chemistry of the at condary pollutant formation. Effect of air pollution on Human heat of particulate pollutants in the respiratory system.	tmo	sphe	re an	1
Unit III	<b>Transport</b>	Models			9 H	ours
models, co	mponents of	ransport models, box models, three-dimensional atmospheric che air quality forecasting and modelling, evaluation and validation, a ng range transport of pollutants. Back trajectory construction and a	air	quali	ty	ort
models, constandards a Unit IV Transport a concentration	mponents of and index, lor <b>Dispersion</b> and dispersion ions from pos	air quality forecasting and modelling, evaluation and validation, and range transport of pollutants. Back trajectory construction and a	air app stima	quali olicat	ty ions <b>9 H</b>	
models, constandards a Unit IV Transport a concentration	mponents of and index, loo <b>Dispersion</b> and dispersio ions from po and predictio	air quality forecasting and modelling, evaluation and validation, and range transport of pollutants. Back trajectory construction and a <b>Models</b> In of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air point - Plume rise, modelling techniques.	air app stima	quali olicat	ty ions 9 He	ours
models, constandards a Unit IV Transport a concentrati modelling a Unit V	mponents of and index, lor <b>Dispersion</b> and dispersion ions from po- and prediction <b>Software</b>	air quality forecasting and modelling, evaluation and validation, and range transport of pollutants. Back trajectory construction and a <b>Models</b> In of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air point - Plume rise, modelling techniques.	air app stima	quali olicat	ty ions <b>9 H</b>	ours
models, con standards a Unit IV Transport a concentrati modelling a Unit V Exposure to	mponents of and index, lor <b>Dispersion</b> and dispersio cons from po and prediction <b>Software 1</b> o computer r	air quality forecasting and modelling, evaluation and validation, and range transport of pollutants. Back trajectory construction and a <b>Models</b> <b>Models</b> n of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air point on - Plume rise, modelling techniques.	air app stima pollu	quali plicat ating ution	ty ions 9 He	ours
models, constandards a Unit IV Transport a concentrati modelling a Unit V	mponents of ind index, lor Dispersion and dispersion ions from po- and prediction Software Do- o computer r	air quality forecasting and modelling, evaluation and validation, and range transport of pollutants. Back trajectory construction and a <b>Models</b> In of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air point - Plume rise, modelling techniques. Modelling models for air quality. Total:	air app stima pollu	quali plicat ating ution	ty ions 9 He 9 He	ours
models, con standards a Unit IV Transport a concentrati modelling a Unit V Exposure to	mponents of mod index, lon Dispersion and dispersion from po- and prediction Software 1 o computer r ntcomes: After comp 7. Know	air quality forecasting and modelling, evaluation and validation, a ang range transport of pollutants. Back trajectory construction and a <b>Models</b> n of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air point n - Plume rise, modelling techniques. <b>Modelling</b> models for air quality. Total: oletion of the course, Student will be able to the causes of climate change	air of app stima sollu	quali olicat ating ution	ty ions 9 Ho 9 Ho 45 Ho	ours
models, co standards a Unit IV Transport a concentrati modelling a Unit V Exposure to Course Ou References	mponents of mod index, lor Dispersion and dispersion ons from po and prediction Software 1 o computer r itcomes: After comp 7. Know 8. Know S:	air quality forecasting and modelling, evaluation and validation, a ng range transport of pollutants. Back trajectory construction and a <b>Models</b> n of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air po- n - Plume rise, modelling techniques. <b>Modelling</b> nodels for air quality. <b>Total:</b> bletion of the course, Student will be able to the causes of climate change the effects of climate change on various environments and variou	air of app stima sollu	quali olicat ating ution	ty ions 9 Ho 9 Ho 45 Ho	ours
models, co standards a Unit IV Transport a concentrati modelling a Unit V Exposure to Course Ou References 13. Rao.M	mponents of mod index, lon Dispersion and dispersion and prediction Software o computer r ntcomes: After comp 7. Know 8. Know s: .N. &RaoH.	air quality forecasting and modelling, evaluation and validation, a ng range transport of pollutants. Back trajectory construction and a <b>Models</b> n of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air pon n - Plume rise, modelling techniques. <b>Modelling</b> models for air quality. <b>Total:</b> Deletion of the course, Student will be able to the causes of climate change the effects of climate change on various environments and variou <b>W.N.</b> , "Air Pollution", Tata McGraw Hill,2006.	air o l app stima stima sollu :	quali blicat ating ution	ty ions 9 Ho 9 Ho 45 Ho s.	ours
models, co standards a Unit IV Transport a concentrati modelling a Unit V Exposure ta Course Ou References 13. Rao.M 14. Richard	mponents of mod index, lon Dispersion and dispersion ons from po- and predictic Software 1 o computer r Itcomes: After comp 7. Know 8. Know 8. Know s: .N. &RaoH. d W.Boube	air quality forecasting and modelling, evaluation and validation, a ang range transport of pollutants. Back trajectory construction and a <b>Models</b> n of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air pon n - Plume rise, modelling techniques. <b>Modelling</b> models for air quality. <b>Total:</b> bletion of the course, Student will be able to the causes of climate change the effects of climate change on various environments and variou V.N., "Air Pollution", Tata McGraw Hill,2006. , Donald L. Fox, D.Bruce Turner& Arthur C. Stern, "Fun	air o l app stima stima sollu :	quali blicat ating ution	ty ions 9 Ho 9 Ho 45 Ho s.	Durs
models, cor standards a Unit IV Transport a concentrati modelling a Unit V Exposure to Course Ou References 13. Rao.M 14. Richard Pollutio	mponents of mod index, lon Dispersion and dispersion and prediction o computer r itcomes: After comp 7. Know 8. Know 8. Know s: .N. &RaoH. d W.Boubel on, Hardcov	air quality forecasting and modelling, evaluation and validation, a ng range transport of pollutants. Back trajectory construction and a <b>Models</b> n of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air po- n - Plume rise, modelling techniques. <b>Modelling</b> nodels for air quality. <b>Total:</b> bletion of the course, Student will be able to the causes of climate change the effects of climate change on various environments and variou <i>V.N.</i> , "Air Pollution", Tata McGraw Hill,2006. , Donald L. Fox, D.Bruce Turner& Arthur C. Stern, "Fun er", 2007.	air o l app stima stima sollu :	quali blicat ating ution	ty ions 9 Ho 9 Ho 45 Ho s.	Durs
models, cor standards a Unit IV Transport a concentrati modelling a Unit V Exposure to Course Ou References 13. Rao.M 14. Richard Pollutio	mponents of mod index, low Dispersion and dispersion and prediction Software o computer r treases: After comp 7. Know 8. Know 8. Know 8. Know s: .N. &RaoH.' d W.Boubel on, Hardcov th Wark, Ce	air quality forecasting and modelling, evaluation and validation, a ang range transport of pollutants. Back trajectory construction and a <b>Models</b> n of air pollutants - wind velocity, wind speed and turbulence; est nt sources - the Gaussian Equation - atmospheric stability - Air pon n - Plume rise, modelling techniques. <b>Modelling</b> models for air quality. <b>Total:</b> bletion of the course, Student will be able to the causes of climate change the effects of climate change on various environments and variou V.N., "Air Pollution", Tata McGraw Hill,2006. , Donald L. Fox, D.Bruce Turner& Arthur C. Stern, "Fun	air of a provide the second se	quali blicat ating ution nodel menta	ty ions 9 Ho 9 Ho 45 Ho s.	ours ours



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV002		CLIMATE CHANGE AND MODELING	L	Т	P	C
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Course Ob			. ,	1.		
		ce the emerging concepts of climate modeling and projecting f	uture	clima	ate	
TT •4 T	<b>U</b> ;	derstand data analysis and application.			0.11	
Unit I		hange and Climate Variability	Daint	2a11_T	9 H	
		nere - weather and Climate - climate parameters (Temperature, governing the atmosphere - Numerical Weather Prediction Mod				
		in Climate Change Projections.	ueis -	muo	aucti	Л
to GCIVIS -	Application	in Chinate Change Projections.				
Unit II	IPCC SRI	ES Scenarios			9 H	ours
Intergovern	mental Pane	el on Climate Change (IPCC) - An Overview - Key Assumption	ns - Se	cenar	io	
Family - St	oryline (A1,	B1, A2, B2).				
Unit III	Clobal Cl	imate MODEL (GCM) and Regional Climate Model (RCM	3		9 H	
Unit III	Giobai Ci	mate MODEL (GCM) and Regional Chinate Model (RCM	J		9 110	Juis
Some typic	al GCMs (H	adCM3Q-UK Met Office) - Issues with GCMs - Introduction t	ORC	Ms a	nd LA	Ms
• 1		ke PRECIS, Sim CLIM, MAGICC/SCENGENE - Advantages				
of GCMs a			una L	, iouu	, anta	500
01 001115 4						
Unit IV		ing Global Climate Model - An Overview			9 H	ours
	•	Selection of GCMs for regional climate change studies - Ense			•	
		es, Model Domain (Spatial domain and temporal domain), Reso				
		dary conditions - Methods of downscaling (Statistical and Dyn	amic	al) - 6	examj	oles
from each a	and their lim	itations.				
Unit V	Analysis /				9 H	
		Post Processing			/ 11	
a. Model va		Post Processing post processing – Introduction to Analysis tools - Ferret, R. Grad	ls. ID	L. SP	SS.	Juis
a. Model va ArcGIS		Post Processing ost processing – Introduction to Analysis tools - Ferret, R, Grad	ls, ID	L, SF	PSS,	<u>Jui s</u>
ArcGIS	alidation - po		ls, ID	L, SF	PSS,	<u>Jui 5</u>
ArcGIS	alidation - po	ost processing – Introduction to Analysis tools - Ferret, R, Graduct - Vulnerability assessment – adaptation strategies.				
ArcGIS b. Climate	alidation - po change Impa	ost processing – Introduction to Analysis tools - Ferret, R, Grad			PSS, 45 H	
ArcGIS	alidation - po change Impa	ost processing – Introduction to Analysis tools - Ferret, R, Graduct - Vulnerability assessment – adaptation strategies.				
ArcGIS b. Climate	alidation - po change Impa tcomes: After com	ost processing – Introduction to Analysis tools - Ferret, R, Graduct - Vulnerability assessment – adaptation strategies. Tot Deletion of the course, Student will be able to				
ArcGIS b. Climate	alidation - po change Impa t <b>comes:</b> After com 1.Know th	ost processing – Introduction to Analysis tools - Ferret, R, Graduct - Vulnerability assessment – adaptation strategies. Tot pletion of the course, Student will be able to e causes of climate change	al:			
ArcGIS b. Climate Course Ou	tcomes: After com 1.Know th 2.Know th	ost processing – Introduction to Analysis tools - Ferret, R, Graduct - Vulnerability assessment – adaptation strategies. Tot Deletion of the course, Student will be able to	al:			
ArcGIS b. Climate Course Ou References	tcomes: After comp 1.Know th 2.Know th	ost processing – Introduction to Analysis tools - Ferret, R, Graduct - Vulnerability assessment – adaptation strategies. Tot pletion of the course, Student will be able to e causes of climate change	al:			
ArcGIS b. Climate Course Ou References 13. IPCC F	tcomes: After comp I.Know th 2.Know th Courth Asses	ost processing – Introduction to Analysis tools - Ferret, R, Grad act - Vulnerability assessment – adaptation strategies. Tot pletion of the course, Student will be able to e causes of climate change e effects of climate change on various environments and variou	al:	dels.	45 H	Durs
ArcGIS b. Climate Course Ou References 13. IPCC F 14. McGuf Sons, I	After comp 1.Know th 2.Know th 2.Know th 3. Fourth Asses fie, K. and I .td, Chichest	ost processing – Introduction to Analysis tools - Ferret, R, Grad act - Vulnerability assessment – adaptation strategies. Tot beletion of the course, Student will be able to e causes of climate change e effects of climate change on various environments and variou sment Report, Cambridge University Press, Cambridge, UK. Henderson-Sellers, A. "A Climate Modelling Primer, Third Ed er, UK. ,2005	al:	dels. John	45 H	Durs
ArcGIS b. Climate Course Ou References 13. IPCC F 14. McGuf Sons, I 15. Neelin	tcomes: After comp 1.Know th 2.Know th 3: Fourth Asses fie, K. and H td, Chichest David J, "C	ost processing – Introduction to Analysis tools - Ferret, R, Grad act - Vulnerability assessment – adaptation strategies. Tot bletion of the course, Student will be able to e causes of climate change e effects of climate change on various environments and various sment Report, Cambridge University Press, Cambridge, UK. Henderson-Sellers, A. "A Climate Modelling Primer, Third Ed er, UK. ,2005 limate Change and Climate Modelling", Cambridge University	al:	dels. John	45 Ho	ours
ArcGIS b. Climate Course Ou References 13. IPCC F 14. McGuf Sons, I 15. Neelin 16. Thoma	tcomes: After comp 1.Know th 2.Know th 2.Know th 3: Fourth Asses fie, K. and I td, Chichest David J, "Cl s Stocker, "	ost processing – Introduction to Analysis tools - Ferret, R, Grad act - Vulnerability assessment – adaptation strategies. Tot beletion of the course, Student will be able to e causes of climate change e effects of climate change on various environments and variou sment Report, Cambridge University Press, Cambridge, UK. Henderson-Sellers, A. "A Climate Modelling Primer, Third Ed er, UK. ,2005	al:	dels. John	45 Ho	ours



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

		ENVIRONMENTAL POLICIES AND LEGISLATION	L	Т	P	С
			3	0	0	3
Course Ob						
	-	knowledge on the policies, legislations, institutional frame we	ork and	l enfo	rcem	ent
		ms for environmental management in India.				
Unit I	Introduct				9 He	ours
		and Environmental Protection – National Environmental			_	
		e and Polluter Pays Principle – Concept of absolute liability –				
	-	ents and Protocols – Montreal Protocol, Kyoto agreement, Rio	o decla	ration	<b>1</b> —	
		ion Act, Water (P&CP) Act, Air (P&CP) Act – Institutional				
framework	(SPCB/CPC	CB/MoEF)				
Unit II	Water (P	&CP) Act, 1974			8 Ho	ours
		regulatory agencies - responsibilities of Occupier Provision rel	ating to	o pre	ventio	n
		Consent to establish, Consent to operate – Conditions of the c	•	-		
		lures, State Water Laboratory – Appellate Authority – Penaltie				
		Provisions for closure/directions in apprehended pollution sit				
					0.77	
Unit III		CP) Act, 1981			8 Ho	
		regulatory agencies - responsibilities of Occupier Provision rel	•	-		
		Consent to establish, Consent to operate – Conditions of the c				-
		lures, State Air Laboratory – Appellate Authority – Penalties Provisions for closure/directions in apprehended pollution sit			1 01	
consent con	inditions etc.		uation			
		riovisions for closure/unections in apprenended portution sit				
Unit IV	Environ	nent (Protection) Act 1986			13 Ho	ours
Genesis of	the Act – d	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif		ı — Si	tting o	of
Genesis of Industries	the Act – de – Coastal Z	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation	n scher	n – Si ne et	tting o c., for	of
Genesis of Industries Municipal	the Act – de – Coastal Z Solid Waste	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards	n scher under H	n – Si ne et Hazar	tting o c., for dous	of
Genesis of Industries Municipal Waste rule	the Act – d – Coastal Z Solid Waste s and that o	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of f occupier, authorization – Biomedical waste rules – responsibilities	n scher under H	n – Si ne et Hazar	tting o c., for dous	of
Genesis of Industries Municipal Waste rule	the Act – d – Coastal Z Solid Waste s and that o	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards	n scher under H	n – Si ne et Hazar	tting o c., for dous	of
Genesis of Industries Municipal Waste rule and role of	the Act – d – Coastal Z Solid Waste s and that of Pollution C	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of f occupier, authorization – Biomedical waste rules – responsibilities control Boards	n scher under H	n – Si ne et Hazar	tting o c., for dous nerato	of rs
Genesis of Industries Municipal Waste rule: and role of <b>Unit V</b>	the Act – de – Coastal Z Solid Waste s and that of Pollution C	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of f occupier, authorization – Biomedical waste rules – responsibilities Control Boards	n scher under H ilities c	n – Si ne et Hazar of ger	tting of c., for dous nerato	of rs
Genesis of Industries Municipal Waste rule and role of <b>Unit V</b> Relevant P	the Act – d – Coastal Z Solid Waste s and that o Pollution C Other To rovisions of	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of occupier, authorization – Biomedical waste rules – responsibilities control Boards pics Findian Forest Act, Public Liability Insurance Act, CrPC, IPC	n scher under H ilities c	n – Si ne et Hazar of ger	tting of c., for dous nerato	of rs
Genesis of Industries Municipal Waste rules and role of <b>Unit V</b> Relevant P	the Act – d – Coastal Z Solid Waste s and that o Pollution C Other To rovisions of	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of occupier, authorization – Biomedical waste rules – responsibilities control Boards Pics E Indian Forest Act, Public Liability Insurance Act, CrPC, IPC ons - Supreme Court Judgments in Landmark cases.	n scher under H ilities c -Public	n – Si me et Hazar of ger	tting o c., for dous nerato <b>7 Ho</b> rest	of rs <b>ours</b>
Genesis of Industries Municipal Waste rule and role of <b>Unit V</b> Relevant P Litigation -	the Act – de – Coastal Z Solid Waste s and that or Pollution C Other To rovisions of Writ petitio	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of occupier, authorization – Biomedical waste rules – responsibilities control Boards Pics E Indian Forest Act, Public Liability Insurance Act, CrPC, IPC ons - Supreme Court Judgments in Landmark cases.	n scher under H ilities c	n – Si me et Hazar of ger	tting of c., for dous nerato	of rs <b>ours</b>
Genesis of Industries Municipal Waste rule and role of <b>Unit V</b> Relevant P	the Act – de – Coastal Z Solid Waste s and that of Pollution C Other To rovisions of Writ petition	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of f occupier, authorization – Biomedical waste rules – responsibilities control Boards pics F Indian Forest Act, Public Liability Insurance Act, CrPC, IPC ons - Supreme Court Judgments in Landmark cases.	n scher under H ilities c -Public	n – Si me et Hazar of ger	tting o c., for dous nerato <b>7 Ho</b> rest	of rs <b>ours</b>
Genesis of Industries Municipal Waste rule and role of <b>Unit V</b> Relevant P Litigation -	the Act – de – Coastal Z Solid Waste s and that of Pollution C Other To rovisions of Writ petition tcomes: After com	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of f occupier, authorization – Biomedical waste rules – responsibilities control Boards pics F Indian Forest Act, Public Liability Insurance Act, CrPC, IPC ons - Supreme Court Judgments in Landmark cases.	n scher under H ilities c -Public	n – Si me et Hazar of ger	tting o c., for dous nerato <b>7 Ho</b> rest	of rs <b>ours</b>
Genesis of Industries Municipal Waste rule and role of <b>Unit V</b> Relevant P Litigation -	the Act – de – Coastal Z Solid Waste s and that of Pollution C Other To rovisions of Writ petitient Mrit comes: After com 9. Know	nent (Protection) Act 1986 elegation of powers – Role of Central Government - EIA Notif one Regulation - Responsibilities of local bodies mitigation e Management - Responsibilities of Pollution Control Boards of f occupier, authorization – Biomedical waste rules – responsibilities control Boards pics F Indian Forest Act, Public Liability Insurance Act, CrPC, IPC ons - Supreme Court Judgments in Landmark cases.	n scher ander H ilities c -Public tal:	n – Si me et Hazar of ger	tting o c., for dous herato 7 Ho rest 45 Ho	of rs <b>ours</b>



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV008		MEMBRANE TECHNOLOGIES FOR WATER A	AND	L	Т	Р	C
		WASTE WATER TREATMENT		3	0	0	3
Course Ob	ojectives:			5	U	U	5
	9	e the concept and principles of membrane separation a	and its a	pplic	ations	s in w	ater
		ater treatment.					
Unit I		Filtration Processes				10 H	
Flow filtra porous, not	tion - Mem	systems- Theory of Membrane separation – mass Tran rane Filtration- Flux and Pressure drop -Types an metric and asymmetric – Plate and Frame, spiral wour mbranes	id choic	e of	mem	brane	
Unit II	<b>Membran</b>	Systems				10 H	ours
Pervaporat Liquid men component	ion – Liquid nbrane - Me	lications – Electro dialysis : Ion exchange membran nembrane – Liquid Pertraction – Supported Liquid Me nbrane manufactures – Membrane Module/Element d Membrane systems - pump types and Pump selection e systems	embrane lesigns –	and Mer	Emul nbrar	lsion ne Sys	stem
Unit III	Membran	Bioreactors				9 H	ours
Principles,	Fouling and	al Perspective of MBRs, Biotreatment Fundamentals, Fouling Control, MBR Design Principles, Design ommercial Technologies, Case Studies.		-			
Unit IV		nt Systems					ours
	- monitoring	ntrol of Fouling and Concentration Polarisation-Pretre of Pretreatment – Langlier Index, Silt Density Index, G					
Unit V	Case Stud	<mark>28</mark>				8 H	ours
		n of membrane-based water and wastewater treatmen – Desalination of brackish water.	t system	ls−Z	ero L	iquid	
			Tota	al:		45 H	ours
Course Ou							
Af	-	n of the course, Student will be			.1		1
		with main membrane processes, principles, sep	paration	mee	chani	sms,	and
	applica	nd the selection criteria for different membrane proce	00000				
		e principle of the most common membrane application					
		it design of project for a particular membrane technologies		licati	<b></b>		
		a design of project for a particular memorane technolog	ogy appi	ncatl	JII.		



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

17EV009		REMOTE SENSING AND GIS APPLICATIONS IN ENVIRONMENTAL MANAGEMENT	L	T	Р	C
			3	0	0	3
Course Ob						
		cate the students on aspects of Remote Sensing				
		p the different remote sensing technique				
		cate the students on aspects of GIS and data management				
	16. Develo	p the GIS Applications for monitoring and management of	environ	nent		
Unit I	Remote Se	nsing Elements			8 H	ours
Historical I		Principles of remote sensing, components of Remote Sensing	g, Energ	y sou		
•		on, Electromagnetic spectrum, Energy interaction, Spectra energy recording technology.	al respo	nse p	attern	ı of
Unit II		ensing Technology			9 H	
along track	scanning, M	e Sensing Systems, Aerial photographs, Photographic system fultispectral remote sensing, Thermal remote sensing, Micro nsors, RADAR, LIDAR				
Unit III	Social Imr	pact Assessment and EIA Documentation			9 H	
institutiona	act assessme l arrangemer	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia	nsition I	Docui		
institutiona of EIA find preparation	act assessme l arrangemen lings – plann l.	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia	nsition I	Docui oort	nenta	ntion
institutiona of EIA find preparation Unit IV	act assessme il arrangemen lings – plann a. <b>Environm</b>	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan	nsition I Ils – Rep	Docui port		ntion
institutiona of EIA find preparation <b>Unit IV</b> Environme Rehabilitat	act assessme l arrangemen lings – plann l. Environm ntal Manage ion Plans – F	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia	nsition I als – Rep gation an	Docun port	menta	ation ours
institutiona of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical an <b>Unit V</b>	act assessme l arrangemen lings – plann a. <b>Environm</b> ntal Manage ion Plans – F nd Quality as <b>Environm</b>	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management	nsition I als – Rep gation an nes – Po	Docun port d st pro	menta 10 He oject a 9 He	ours ours
institutiona of EIA find preparation <b>Unit IV</b> Environme Rehabilitat – Ethical ar <b>Unit V</b> Environme Assessmen methods – contaminar	act assessme act assessme arrangemen lings – plann a. Environm ntal Manage ion Plans – F nd Quality as Environm ntal risk asse t – Exposure Event tree ar	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm pects of Environmental Impact Assessment- Case Studies.	nsition I Ils – Rep gation an nes – Po valuatio DP and F ure mod	Docum port d st pro n – E EMA deling	menta <b>10 H</b> oject a <b>9 H</b> xpost of	ours audit
institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical ar Unit V Environme Assessmen methods – 1 contaminar	act assessme act assessme arrangemen lings – plann a. <b>Environm</b> ntal Manage ion Plans – F nd Quality as <b>Environm</b> ntal risk asse t – Exposure Event tree ar at- Risk Char	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management essment framework-Hazard identification -Dose Response E Factors, Tools for Environmental Risk Assessment– HAZC ad fault tree analysis – Multimedia and multipath way exposs acterization Risk communication - Emergency Preparedness	nsition I Ils – Rep gation an nes – Po valuatio DP and F ure mod	Docum port d st pro n – E EMA leling -Desi	menta <b>10 H</b> oject a <b>9 H</b> xpost of	ours audit ours irisk
institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical an Unit V Environme Assessmen methods – i contaminar managemen	act assessment l arrangement lings – plann the second second metal Manage ion Plans – F and Quality as <b>Environm</b> ntal risk asset t – Exposure Event tree ar nt Risk Char nt programs.	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ressment framework-Hazard identification -Dose Response E Factors, Tools for Environmental Risk Assessment– HAZC ad fault tree analysis – Multimedia and multipath way expos acterization Risk communication - Emergency Preparedness T	nsition I als – Rep gation an nes – Po valuatio P and F ure mod s Plans -	Docum port d st pro n – E EMA leling -Desi	<b>10 H</b> oject a <b>9 H</b> xpost of gn of	ours audit ours irisk
institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical an Unit V Environme Assessmen methods – i contaminar managemen	act assessme act assessme arrangemen lings – plann a. Environm ntal Manage ion Plans – F nd Quality as Environm ntal risk asse t – Exposure Event tree ar nt programs. atcomes: After comp	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ressment framework-Hazard identification -Dose Response E Factors, Tools for Environmental Risk Assessment– HAZC ad fault tree analysis – Multimedia and multipath way expos acterization Risk communication - Emergency Preparedness pletion of the course, Student will be able to	nsition I Ils – Rep ation annes – Po valuatio DP and F ure mod s Plans –	Docum port d st pro n – E EMA eling -Desi	menta 10 Ho oject a 9 Ho xpost of gn of 45 Ho	ours ours audit ours `risk
institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical ar Unit V Environme Assessmen methods – contaminar	act assessme act assessme arrangemen lings – plann a. Environm ntal Manage ion Plans – F nd Quality as Environm ntal risk asse t – Exposure Event tree ar nt programs. After comp 7. Unders	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management essment framework-Hazard identification -Dose Response E Factors, Tools for Environmental Risk Assessment– HAZC and fault tree analysis – Multimedia and multipath way exposs acterization Risk communication - Emergency Preparedness Deletion of the course, Student will be able to stand the necessity to study the impacts and risks that will be	nsition I Ils – Rep ation annes – Po valuatio DP and F ure mod s Plans –	Docum port d st pro n – E EMA eling -Desi	menta 10 Ho oject a 9 Ho xpost of gn of 45 Ho	ours ours audit ours `risk
institutiona of EIA find preparation Unit IV Environme Rehabilitat – Ethical an Unit V Environme Assessmen methods – i contaminar managemen	act assessment larrangement lings – plann a. Environm ntal Manage ion Plans – F and Quality as Environm ntal risk asset t – Exposure Event tree ar ant programs. It comes: After comp 7. Unders industr	nt - Relationship between social impacts and change in com- nts. Individual and family level impacts. Communities in tra- ing – organization of information and visual display materia ental Management Plan ment Plan - preparation, implementation and review – Mitig Policy and guidelines for planning and monitoring programm pects of Environmental Impact Assessment- Case Studies. ental Risk Assessment and Management ressment framework-Hazard identification -Dose Response E Factors, Tools for Environmental Risk Assessment– HAZC ad fault tree analysis – Multimedia and multipath way expos acterization Risk communication - Emergency Preparedness pletion of the course, Student will be able to	nsition I als – Rep ation an nes – Po valuatio DP and F ure mod s Plans - <b>`otal:</b>	Docum port d st pro EMA eling -Desi	nenta <b>10 H</b> oject a <b>9 H</b> xpost of gn of <b>45 H</b> orojec	ours audit ours ure `risk ours ts ou



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#### GE6075 PROFESSIONALETHICSINENGINEERING LTPC 3 003 INITI HUMANVALUES 10 Morals, values and Ethics-Integrity-Workethic -Servicelearning-Civic virtue -Respectforothers-Livingpeacefully-Caring-Sharing-Honesty-Courage-Valuingtime-Cooperation-Commitment confidence-Self Character Spirituality Introduction Empathy to Yoga and meditation for professional excellence and stress management. 9 INITI **ENGINEERINGETHICS** Sensesof'EngineeringEthics'-Varietyofmoralissues-Typesofinquiry-Moraldilemmas-MoralAutonomy Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models ofprofessional roles -Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories ENGINEERINGAS SOCIALEXPERIMENTATION UNITIII 9 Engineeringas Experimentation – Engineers as responsible Experimenters Codes of Ethics ABalancedOutlookonLaw. UNITIV SAFETY, RESPONSIBILITIES AND RIGHTS 9 Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk -Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - OccupationalCrime-ProfessionalRights-EmployeeRights-IntellectualPropertyRights(IPR)-Discrimination UNITV **GLOBALISSUES** 8 Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors -MoralLeadership-CodeofConduct-CorporateSocialResponsibility **TOTAL:45PERIODS OUTCOMES:** •

• Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

### **TEXTBOOKS:**

- 1. MikeW.MartinandRolandSchinzinger, "EthicsinEngineering", TataMcGrawHill, NewDelhi, 2003.
- 2. GovindarajanM,NatarajanS,SenthilKumarV.S,"EngineeringEthics",PrenticeHallofIndia,NewDelhi,2004.

#### **REFERENCES:**

- 1. Charles B.Fleddermann, "EngineeringEthics", Pearson Prentice Hall, New Jersey, 2004.
- CharlesE.Harris,MichaelS.PritchardandMichaelJ.Rabins,"EngineeringEthics– ConceptsandCases",CengageLearning,2009
- 3. JohnRBoatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
- 4. EdmundGSeebauerandRobertLBarry, "FundametalsofEthicsforScientistsandEngineers", OxfordUniversit yPress, Oxford, 2001
- 5. LauraP.HartmanandJoeDesjardins, "BusinessEthics:DecisionMakingforPersonalIntegrityandSocial Responsibility"McGrawHill education,IndiaPvt. Ltd.,NewDelhi 2013.



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### GE6351 ENVIRONMENTALSCIENCEANDENGINEERING

#### UNITI ENVIRONMENT, ECOSYSTEMSAND BIODIVERSITY

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment - conceptof an ecosystem - structure and function of anecosystem - producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flowin the ecosystem – ecological succession processes Introduction, types, characteristic features, structure and function of the (a) for este cosystem (b) grasslandecosystem (c) deserte cosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to biodiversitydefinition: genetic, diversitv biogeographical classification species and ecosystem \_ of India value ofbiodiversity:consumptiveuse,productiveuse,social,ethical,aestheticandoptionvalues-Biodiversity at global, national and local levels - India as a mega-diversity nation - hot-spots ofbiodiversity - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts endangeredandendemicspeciesofIndia-conservationofbiodiversity:In-situandex-situconservation of biodiversity. Field study of common plants, insects, birds Field study of simpleecosystemspond,river,hillslopes,etc.

#### UNITII ENVIRONMENTAL POLLUTION

Definition — causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formationofsmog,PAN,acidrain,oxygenandozonechemistry;-Mitigationprocedures-Controlofparticulateandgaseousemission,ControlofSO<sub>2</sub>,NO<sub>x</sub>,COandHC)(b)Waterpollution:Physicaland chemical properties of terrestrial and marine water and their environmental significance; Waterquality parameters – physical, chemical and biological; absorption of heavy metals - Water treatmentprocesses. (c) Soil pollution - soil waste management: causes, effects and control measures ofmunicipal solid wastes — (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclearhazards–role of an individual in prevention of pollution — pollution case studies — Field study of localpollutedsite—

#### UNITIII NATURALRESOURCES

Urban/Rural/Industrial/Agricultural.

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining,dams and their effects on forests and tribal people - Water resources: Use and overutilization ofsurfaceandgroundwater, dams-benefitsandproblems-Mineralresources:Useandexploitation, environmental effects of extracting and using mineral resources, case studies - Food resources:World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energyneeds, renewable and non renewable energy sources, use of alternate energy sources. EnergyConversion processes — Biogas — production and uses, anaerobic digestion; studies case Landresources:Landasaresource,landdegradation,maninducedlandslides,soil erosionanddesertification - role individual of in conservation of natural resources Equitable an use of resourcesforsustainablelifestyles.IntroductiontoEnvironmentalBiochemistry:Proteins-

Biochemicaldegradation of pollutants, Bioconversion of pollutants. Field study of local area to documentenvironmentalassets-river/forest/grassland/hill/mountain.

#### UNITIV SOCIAL ISSUESAND THE ENVIRONMENT

Fromunsustainable to sustainable development-urban problems related to energy -waterconservation, rain

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ofpeople; its problems and concerns, cases tudies – role of non-governmental organization environmentale thics: Issues and possible solutions – 12 Principles of green chemistry - nuclear

accidents and holocaust, case studies. - wasteland reclamation - consumerism and waste products -environment production act - Air act - Water act - Wildlife protection act - Forest conservation act - The Biomedical Waste (Management and Handling) Rules: 1998 and amendmentsscheme oflabelingofenvironmentallyfriendlyproducts(Ecomark).enforcementmachineryinvolvedinenvironmental legislation-central boardsand state pollution control disaster management: floods,earthquake,cycloneandlandslides.Publicawareness.

### UNITV HUMANPOPULATIONANDTHEENVIRONMENT

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and childwelfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology inenvironmentandhumanhealth—Casestudies.

### TOTAL:45PERIODS

6

### **TEXTBOOKS:**

- 1. GilbertM.Masters,"IntroductiontoEnvironmentalEngineeringandScience",2ndedition,PearsonEducation,2 004.
- 2. BennyJoseph,"Environmental ScienceandEngineering",TataMcGraw-Hill,NewDelhi,2006.

#### **REFERENCES:**

- 1. Trivedi.R.K., "HandbookofEnvironmentalLaws, Rules, Guidelines, Compliances and Standards", Vol.Iand II, EnviroMedia, 3<sup>rd</sup> edition, BPB publications, 2010.
- 2. Cunningham, W.P.Cooper, T.H.Gorhani, "EnvironmentalEncyclopedia", JaicoPubl., House, Mumbai, 2001.
- 3. DharmendraS.Sengar,"Environmentallaw",PrenticehallofIndiaPVTLTD,NewDelhi,2007.
- 4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.



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ME6602

### AUTOMOBILEENGINEERING

LTPC

#### **OBJECTIVES:**

- Tounderstandtheconstructionand workingprinciple of various parts of an automobile.
- Tohavethepracticefor assemblinganddismantlingofenginepartsandtransmissionsystem

### UNITI VEHICLE STRUCTUREAND ENGINES

Types of automobiles, vehicle construction and different layouts, chassis, frame andbody, Vehicle aerodynamics (various resistances and moments involved), IC engines –components-functions andmaterials, variable valvetiming (VVT).

### UNITII ENGINEAUXILIARYSYSTEMS

Electronically controlled gasoline for SI injection system engines, Electronically controlleddiesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system). Turbo chargers (WGT. VGT). Engine emission control bv threeway catalytic convertersystem, Emissionnorms (EuroandBS).

### UNITIII TRANSMISSIONSYSTEMS

Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transferbox, fluid flywheel, torque converter, propellershaft, slip joints, universal joints, Differential and rearaxle, Hotchkiss Drive and Torque Tube Drive.

### UNITIV STEERING, BRAKESANDSUSPENSION SYSTEMS

Steeringgeometryandtypesofsteeringgearbox-PowerSteering, Types of Front Axle,Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System(ABS),electronicbrakeforcedistribution(EBD)and TractionControl.

### UNITV ALTERNATIVE ENERGY SOURCES

UseofNaturalGas,Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol andHydrogen in Automobiles-Engine modifications required –Performance, Combustion and EmissionCharacteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel CellNote: Practical Training in dismantling and assembling of Engine parts and Transmission Systemsshouldbe giventothestudents.

#### **OUTCOMES:**

- Uponcompletionofthiscourse, the
- studentswillbeabletoidentifythedifferentcomponentsinautomobileengineering.
- Have clearunderstandingon differentauxiliaryand transmissionsystemsusual.

#### **TEXTBOOKS:**

- 1. KirpalSingh, "AutomobileEngineering", Vol1&2, SeventhEdition, StandardPublishers, NewDelhi, 1997.
- 2. JainK.K.andAsthana.R.B, "AutomobileEngineering" TataMcGrawHillPublishers, NewDelhi, 2002.

#### **REFERENCES:**

- 1. Newton ,Steeds andGaret, "MotorVehicles",Butterworth Publishers,1989.
- 2. JosephHeitner, "Automotive Mechanics," Second Edition, East-West Press, 1999.

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TOTAL:45PERIODS



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### **ME6701**

#### **POWERPLANTENGINEERING**

3003

LTPC

### **OBJECTIVES:**

Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintimeters of the second seconenance.

#### UNITI **COALBASEDTHERMALPOWER PLANTS**

Rankinecycle-improvisations, Layoutof moderncoalpowerplant, SuperCriticalBoilers, FBCBoilers, Turbines, Condensers. Steam & Heat rate, Subsystems of thermal power plants Fuel andashhandling, Draughtsystem, Feed watertreatment. Binary Cycles and Cogeneration systems.

#### UNITII DIESEL, GASTURBINEAND COMBINED CYCLEPOWERPLANTS

Otto, Diesel, Dual &Bravton Cycle - Analysis &Optimisation.Components of Diesel and Gas Turbinepowerplants.CombinedCyclePowerPlants. Integrated GasifierbasedCombinedCyclesystems.

#### UNITIII NUCLEAR POWER PLANTS

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of NuclearReactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measuresforNuclearPowerplants.

#### UNITIV **POWERFROMRENEWABLE ENERGY**

Electric Power Plants — Classification, Typical Layout and associated Hvdro components includingTurbines.Principle,ConstructionandworkingofWind,Tidal,SolarPhotoVoltaic(SPV),SolarThermal,GeoT hermal, BiogasandFuelCellpowersystems.

#### UNITV ENERGY, ECONOMICANDENVIRONMENTALISSUESOFPOWERPLANTS 8

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relativemerits&demerits, Capital&OperatingCostofdifferentpowerplants.

Pollutioncontroltechnologies includingWasteDisposal OptionsforCoalandNuclearPowerPlants.

TOTAL:45PERIODS

### **TEXTBOOK:**

Nag.P.K., "PowerPlantEngineering", ThirdEdition, TataMcGraw-HillPublishingCompanyLtd., 2008. 1.

### **REFERENCES:**

- El-Wakil.M.M.,"PowerPlantTechnology", TataMcGraw-HillPublishingCompanyLtd., 2010. 1.
- 2. Black&Veatch,Springer, "PowerPlantEngineering", 1996.
- ThomasC.Elliott,KaoChenandRobertC.Swanekamp,"PowerPlantEngineering",SecondEdition,Standard 3. HandbookofMcGraw-Hill,1998.
- 4. GodfreyBoyle,"Renewableenergy", OpenUniversity, OxfordUniversityPressinassociationwith the OpenUni versity,2004.

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### ME6016

### **OBJECTIVES:**

### ADVANCEDI.CENGINES

- Tounderstandthe underlyingprinciples of operation of different ICE ngines and components.
- Toprovideknowledgeonpollutant formation, control, alternatefuel etc.

### UNITI SPARK IGNITIONENGINES

Mixturerequirements–Fuelinjectionsystems–Monopoint,Multipoint&Directinjection-Stagesofcombustion – Normal and Abnormal combustion – Knock - Factors affecting knock – Combustionchambers.

### UNITII COMPRESSIONIGNITION ENGINES

DieselFuelInjectionSystems-Stagesofcombustion-Knocking -Factorsaffectingknock-DirectandIndirectinjectionsystems-Combustionchambers-FuelSpraybehaviour-Spraystructureandspraypenetration-Airmotion-IntroductiontoTurbocharging.

### UNITIII POLLUTANTFORMATIONAND CONTROL

Pollutant – Sources – Formation of Carbon Monoxide, Unburnt hydrocarbon, Oxides of Nitrogen, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic converters, SelectiveCatalyticReductionandParticulateTraps–Methodsofmeasurement– EmissionnormsandDrivingcycles.

### UNITIV ALTERNATIVE FUELS

Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits-Engine Modifications.

### UNITV RECENTTRENDS

Air assisted Combustion, Homogeneous charge compression ignition engines – Variable Geometryturbochargers–CommonRailDirectInjectionSystems-HybridElectricVehicles–NOxAdsorbers-OnboardDiagnostics.

### **TOTAL:45 PERIODS**

### **TEXTBOOKS:**

- 1. Ramalingam.K.K.,"InternalCombustionEngineFundamentals", ScitechPublications, 2002.
- 2. Ganesan,"Internal Combustion Engines", IIEdition, TMH,2002.

#### **REFERENCES:**

- 1. Mathur.R.B.andR.P. Sharma,"InternalCombustionEngines".,DhanpatRai& Sons2007.
- 2. DuffySmith,"AutoFuelSystems",TheGoodHeartWillcoxCompany,Inc.,1987.
- 3. EricChowenitz, "Automobile Electronics", SAE Publications, 1995

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#### **GE6757 OBJECTIVES:**

### TOTALQUALITYMANAGEMENT

Tofacilitate theunderstanding of Quality Managementprinciples and process.

#### UNITI **INTRODUCTION**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions ofproductand service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran andCrosby -Quality statements - Customer Customer Barriers to TOM focus \_ orientation, Customersatisfaction, Customercomplaints, Customerretention-Costsofquality.

#### UNITII TOMPRINCIPLES

Leadership-Strategicqualityplanning,QualityCouncils-Employeeinvolvement-Motivation, Empowerment, Teamand Teamwork, Qualitycircles Recognition and Reward, Performance appraisal process improvement - PDCA cycle, 5S, Kaizen - Supplier -Continuous partnership Partnering, Supplierselection, SupplierRating.

#### UNITIII TOMTOOLS AND TECHNIQUESI

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Benchmarkingprocess-FMEA-Stages, Types. 9

#### UNITIV **TQMTOOLS AND TECHNIQUES II**

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) -Taguchiqualityloss function- TPM-Concepts, improvementneeds-Performancemeasures.

#### UNITV **QUALITYSYSTEMS**

NeedforISO9000-ISO9001-2008QualitySystem-Elements,Documentation,QualityAuditing-QS9000-ISO14000-Concepts, Requirements and Benefits-TQMImplementation in manufacturing and services ectors...

### TOTAL:45PERIODS

### **TEXTBOOK:**

1.

DaleH.Besterfiled, etat., "TotalqualityManagement", ThirdEdition, PearsonEducationAsia, IndianRep rint,2006.

### **REFERENCES:**

- JamesR.EvansandWilliamM.Lindsay,"TheManagementandControlofQuality",8thEdition,FirstIndianEditi 1. on,CengageLearning,2012.
- 2 Suganthi.LandAnandSamuel,"TotalQualityManagement", PrenticeHall(India)Pvt.Ltd., 2006.
- Janakiraman.BandGopal.R.K., "TotalQualityManagement-3. TextandCases", PrenticeHall(India)Pvt.Ltd., 2006.

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ENVIRONMENTALSTUDIES	L	Т	Р	С
(Common to allB.E. / B.TechDegreeProgrammes)	3	0	0	3

#### 1701CH201

#### **COURSEOBJECTIVES:**

1. Realize the interdisciplinary and holistic nature of the environment.

- 2.Understand hownatural resources and environmentaffect the quality of life and stimulate the quest for sustainable development.
- 3. Recognize the socio-economic, political and ethical issues in environmental science.

#### ECOSYSTEMS ANDBIODIVERSITY **UNIT I**

Conceptofanecosystem - structureandfunctionofanecosystem -producers, consumers and decomposers - Oxygen cycle and Nitrogen cycle – energyflow in the ecosystem - ecological succession processes -Introduction,types,characteristicfeatures,structureandfunctionofthe(a)forest ecosystem (b)grassland ecosystem (c)desertecosystem (d)aquaticecosystems(ponds, streams, lakes, rivers, oceans, estuaries)- Introduction to biodiversity ecosystemdiversity definition: genetic, species and value of biodiversity: consumptiveuse, productiveuse, social, ethical, aestheticandoptionvalues-hot-spotsofbiodiversity threatstobiodiversity:habitatloss.poachingofwildlife.man-wildlifeconflicts-endangeredand endemic species of India-conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinalplants inyour native place.

#### UNIT II **NATURAL RESOURCES**

Forestresources:Useandover-exploitation, deforestation, casestudies-timberextraction, mining, dams and their effects on forests and tribal people-Water resources: Use and over utilization of surface and ground water, damsbenefits and problems - Mineral resources: Use and exploitation, environmental effects of extractingandusingmineralresources, casestudies-Foodresources: Worldfoodproblems, changescaused by agriculture and overgrazing, effects of moderna griculture, fertilizer-pesticide problems, waterlogging, salinity,casestudies-Energy resources:Growingenergy needs,renewableandnonrenewableenergy sources, useofalternateenergysources.EnergyConversionprocesses-Biogas-productionanduses,anaerobic digestion;casestudies-Landresources:Landasaresource,landdegradation,maninducedlandslides,soil erosionanddesertification-roleofanindividualinconservationofnaturalresources-Equitableuseof resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village. UNIT III **ENVIRONMENTAL POLLUTION** 9 Hours Definition-Source, causes, effects and control measures of: (a) Airpollution-Mitigation procedures-Controlofparticulateandgaseousemission, ControlofSOX, NOx, COandHC)-Technologyforcapturing CO2(metalloorganicframeworks)(b)Waterpollution-Wastewatertreatmentprocesses.(c)Soilpollution -soilwaste management: causes, effects and control measures of municipal solid wastes -(d) Marine pollution(e) Noise pollution(f) Thermal pollution(g) Nuclear hazards-roleof an individual inprevention of pollution-pollutioncasestudies.Documentationstudy oflocalpollutedsite-Urban/Rural/Industrial/ Agricultural. SOCIALISSUESANDTHEENVIRONMENT UNIT IV 8 Hours From unsustainabletosustainabledevelopment-urbanproblemsrelatedtoenergy-waterconservation, rain water harvesting, watershedmanagement-environmental ethics:Issues andpossiblesolutions-12Principles ofgreenchemistry -consumerismandwasteproducts-environmentprotectionact-Airact-Wateract-Wildlifeprotectionact-Forestconservationact-TheBiomedicalWaste(ManagementandHandling)Rules; 1998andamendments-schemeoflabelingofenvironmentally friendly products(Ecomark)centralandstate pollutioncontrolboards-disastermanagement:floods,earthquake-Publicawareness.Analyzetherecent steps taken bygovernmentof India to preventpollution (Green India andClean India).

#### UNIT V HUMANPOPULATIONANDTHEENVIRONMENT

**10 Hours** 

### **10 Hours**



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environmentandhumanhealth-humanrights-valueeducation-HIV/ AIDS-womenandchildwelfare-Environmentalimpactanalysis(EIA)-GIS-remotesensing-roleofinformationtechnology inenvironment andhumanhealth-Casestudies.Documentationstudy oftheHumanhealthandtheenvironmentinnearby Hospital (Statistical report).

### **TOTAL: 45 HOURS**

#### **FURTHER READING:**

Human rights: E- waste andbiomedical waste - Identification of adulterants in foodmaterials

#### **COURSEOUTCOMES:**

On theSuccessfulcompletion of the course, Students willbe able to

CO1: Describe the importance of ecosystem and its conservation.

CO2: Differentiate various natural resources and the urgentneed to conserve the natural resources. CO3:

Explain the different types of pollution and its effects.

CO4: Describe the various environmentalprotection acts.

CO5: Explain the major diseases, women, child developmentand the impacts of population explosion.

#### **REFERENCES:**

1. Trivedi.R.K., "Handbookof EnvironmentalLaws, Rules, Guidelines, Compliances and Standards", Vol.I and II, EnviroMedia, 3<sup>rd</sup> edition, BPB publications, 2010.

2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", JaicoPublishingHouse, Mumbai, 2001.

3. DharmendraS. Sengar, "Environmentallaw", PrenticehallofIndiaPVTLTD, NewDelhi, 2007.

4.Rajagopalan.R,"EnvironmentalStudies-FromCrisistoCure",OxfordUniversityPress,2005.

5. BennyJoseph, "Environmental Science and Engineering", TataMcGraw-Hill, NewDelhi, 2006.

6.https://en.wikipedia.org/wiki/Carbon capture and storage

7. Ravikrishnan. A., "EnvironmentalScienceandEngineering", SriKrishnaHi-techPublishingCompanyPvt. Ltd.



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#### 1701MGX01

### PROFESSIONALETHICS

### **HUMANVALUES**

UNIT I 9 Hours MoralsandEthics- Honesty-Integrity- Values- WorkEthic- CivicVirtue-RespectforOthers- LivingPeacefully CaringandSharing- Self-Confidence- Courage- Co-operation- Commitment- Empathy.

#### UNIT II ENGINEERINGETHICS ANDPROFESSIONALISM

Scopeof'EngineeringEthics'-Varietyofmoralissues-Typesofinquiry-Acceptingandsharing responsibility Ethicaldilemmas-Moralautonomy-Kohlberg'sandGilligan'stheory-Consensus andcontroversy ProfessionandProfessionalism-ModelsofProfessionalRoles-Rightaction theories-Sensesofcorporateresponsibilityjustification-NSPE-IEEE-Institution Codesofethics:Importancelimitation-Abuse-Sample codes ofEngineers(India).

#### ENGINEERINGAS SOCIAL EXPERIMENTATION **UNIT III**

Engineeringasexperimentation- Engineersasresponsibleexperimenters- Balancedoutlookon law- Cautiousoptimism-Safetyandrisk-Assessing andreducing risk-Safeexits-TheChallengercase study-BhopalGasTragedy-The Three Mile Island and Chernobyl.

#### UNIT IV WORKPLACE RESPONSIBILITIES AND RIGHTS

9 Hours FundamentalRights-Responsibilities and Duties of Indian Citizens-Teamwork-Ethicalcorporate climate-Collegialityandloyalty- Managingconflict- Respectforauthority- Collectivebargaining- Confidentiality-Conflictsof interest-Occupationalcrime-Professionalrights-Employee rights

#### UNIT V **GLOBALISSUES**

Multinational corporations: Technology transfer and appropriate technology -International rights promoting morally justmeasures-Environmentalethics:Engineering.ecology-economics-Human andsentientcentredandbioandecocentricethics- Computerethicsand internet- Engineersas managers-Consultingengineers-Engineers asexpert witnesses and advisors-Moralleadership.

### FORFURTHER READING/SEMINAR/CBS

#### **TOTAL: 45HOURS**

1.Sample code of ethicslike IETE, ASME, ASCE, Indian Institute of Materials Management. 2.Virtuesforlife

#### **REFERENCES:**

- 1. MikeWMartinandRolandSchinzinger,EthicsinEngineering,4thedition,TataMcGrawHill PublishingCompanyPvtLtd, New Delhi, 2014.
- 2. MGovindarajan, S Natarajanand VSSenthilKumar, Engineering Ethics, PHILearning Private Ltd, New Delhi, 2012.
- 3. RSNaagarazan, Atextbookonprofessionalethics and human values, New ageinternational limited, New Delhi, 2006.
- 4. CharlesE Harris, MichaelS Protchard and MichaelJ Rabins, EngineeringEthics- Conceptsand Cases, Wadsworth Thompson Learning, United States, 2005.
- 5. http://www.slideworld.org/slidestag.aspx/human-values-and-Professional-ethics.

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1901MCX01	ENVIRONMENTALSCIENCE	$\mathbf{L}$	Т	Р	С
	(Common to allBranchesofB.E/B.Tech)	2	0	0	0

#### MODULEI ECOSYSTEMSANDBIODIVERSITY

Conceptofanecosystem-structureandfunctionofanecosystem-producers, consumersanddecomposers-OxygencycleandNitrogencycle-energy flowintheecosystem-ecological succession processes-Introduction, types, characteristic features, structure and function of the (a) for este cosystem (b)grassland ecosystem (c)desertecosystem(d)aquaticecosystems(ponds, streams, lakes, rivers, oceans, estuaries)- Introduction to biodiversity definition: genetic. species and ecosystemdiversity value of biodiversity: consumptiveuse, productiveuse, social, ethical, aestheticandoptionvalues-hot-spotsofbiodiversitythreatstobiodiversity:habitat loss,poachingofwildlife,man-wildlifeconflicts-endangeredandendemic speciesofIndiaconservation of biodiversity: In-situandex-situconservation of biodiversity. Documentation of the medicinal plants inyour native place

#### MODULEII NATURALRESOURCES

#### Forestresources:Use andover-exploitation, deforestation, cases tudiestimberextraction, mining, dams and theireffectsonforestsandtribalpeople-Waterresources:Useandoverutilizationofsurfaceandground water, damsbenefitsandproblems-Mineral resources: Useandexploitation, environmental effectsof extractingandusingmineralresources, casestudies-Foodresources: Worldfoodproblems, changescaused by agricultureandovergrazing, effects of modernagriculture, fertilizer-pesticide problems, waterlogging, salinity, casestudies-Energy resources: Growingenergy needs, renewable and nonrenewable energy sources, useofalternateenergy Conversionprocesses-Biogas-productionanduses, anaerobic sources.Energy digestion;casestudies -Landresources:Landasaresource,landdegradation,maninducedlandslides, soil erosionanddesertification-roleofanindividual inconservationofnatural resources-Equitableuseof resources for sustainable lifestyles.Documentation of the effectof modern Agriculture in your nearbyVillage

#### MODULEIII ENVIRONMENTAL POLLUTION

Definition– Source, causes, effects and control measures of: (a) Air pollution- Mitigation procedures- Control of particulate and gase ouse mission, Control of SOX, NO<sub>X</sub>, CO and HC)-Technology for capturing CO<sub>2</sub> (metalloorganic frameworks) (b) Waterpollution–Wastewater treatment processes. (c) Soil pollution-soil wastemanagement: causes, effects and control measures of municipal solid wastes–(d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies. Documentation study of local polluted site – Urban/Rural/Industrial/Agricultural.

MODILE FRU COCLATICCHECANDTHEENWIDONMENT

#### **10 Hours**

#### 10 Hours

#### 9 Hours

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Fromunsustainabletosustainabledevelopment–urbanproblemsrelatedtoenergy–waterconservation,rain waterharvesting,watershedmanagement-environmentalethics:Issuesandpossiblesolutions–12Principles ofgreenchemistry–consumerismandwasteproducts–environmentprotectionact–Airact–Wateract– Wildlifeprotectionact–Forestconservationact–TheBiomedicalWaste(ManagementandHandling)Rules; 1998andamendments-schemeoflabelingofenvironmentally friendly products(Ecomark)centralandstate pollutioncontrolboards- disastermanagement:floods,earthquake- Publicawareness.Analyzetherecentsteps taken bygovernmentofIndia to preventpollution (GreenIndia and Clean India)

#### MODULEV HUMANPOPULATIONANDTHEENVIRONMENT 8 Hours Population

growth, variation among nations – population explosion – family welfare programme– environmentandhumanhealth– humanrights–valueeducation–HIV/AIDS–womenandchildwelfare– Environmentalimpactanalysis(EIA)-GISremotesensing-roleofinformationtechnologyinenvironmentand human health – Case studies. Documentation studyof the Human health andthe environment in nearbyHospital (Statistical report)

**TOTAL: 45HOURS** 

#### **REFERENCES:**

- Trivedi.R.K., "HandbookofEnvironmentalLaws, Rules, Guidelines, Compliances and Standards", Vol. Iand II, Enviro Media, 3rd edition, BPBpublications, 2010.
- Cunningham, W.P.Cooper, T.H.Gorhani, "EnvironmentalEncyclopedia", JaicoPubl., House, Mumbai, 2001.
- 3. Dharmendra S.Sengar, "Environmental law", Prentice hallof India PVT LTD, NewDelhi, 2007.
- 4. Rajagopalan, R, "EnvironmentalStudies-FromCrisis to Cure", OxfordUniversityPress, 2005.
- 5. BennyJoseph, "EnvironmentalScience andEngineering", Tata McGraw-Hill, NewDelhi, 2006
- 6. Ravikrishnan"EnvironmentalScience andEngineering"SriKrishna Hi-tech Publishing CompanyPvt
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#### 1703EV017 INDUSTRIAL WASTE MANAGEMENTL T P C

3003

UNIT I INTRODUCTION Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling -generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management

#### UNIT II INDUSTRIAL POLLUTION PREVENTION & WASTE MINIMISATION

Prevention vis a vis Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution Prevention Programs in Industries.

#### UNIT III INDUSTRIAL WASTEWATER TREATMENT

Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation – Removal of Inorganic Constituents – Precipitation, Heavy metal removal, Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis& Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies

#### UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT

Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects

#### UNIT V CASE STUDIES

Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries



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B.E. Computer Science and Engineering | E.G.S. Pillay Engineering College (Antonomous) | Regulations 2017 Approved in I Academic Council Meeting held on 16-07-2017

1701CH201

ENVIRONMENTAL STUDIES P С L т (Common to all B.E. / B.Tech Degree Programmes) 3 0 3 0

#### COURSE OBJECTIVES:

- 1. Realize the interdisciplinary and holistic nature of the environment.
- 2. Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development.
- Recognize the socio-economic, political and ethical issues in environmental science.

#### UNIT I ECOSYSTEMS AND BIODIVERSITY

Concept of an ecosystem - structure and nunction of an ecosystem - producers, consumers and decomposers -Oxygen cycle and Nitrogen cycle - energy flow in the ecosystem - ecological succession processes -Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) -Introduction to biodiversity definition: genetic, species and ecosystem diversity - value of biodiversity. consumptive use, productive use, social, ethical, aesthetic and option values - hot - spots of biodiversity threats to biodiversity: habitat loss, poaching of wildlife, man - wildlife conflicts - endangered and endemic species of India - conservation of biodiversity. In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place.

#### UNIT II NATURAL RESOURCES

Forest resources. Use and over - exploration, deforestation, case studies - timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and overutilization of surface and ground water, dams-benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes - Biogas - production and uses, anaerobic digestion; case studies - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village. UNIT III ENVIRONMENTAL POLLUTION

Definition - source, causes, errects and control measures of: (a) Air pollution - Mitigation procedures -Control of particulate and gaseous emission, Control of SO<sub>X</sub>, NO<sub>x</sub>, CO and HC) - Technology for capturing CO<sub>2</sub> (metallo- organic frame works) (b) Water pollution - Waste water treatment processes. (c) Soil pollution - soil waste management; causes, effects and control measures of municipal solid wastes - (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - role of an individual in prevention of pollution - pollution case studies. Documentation study of local polluted site - Urban / Rural / Industrial / Agricultural.

#### UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development - urban problems related to energy - water conservation, rain water harvesting, watershed management - environmental ethics: Issues and possible solutions - 12 Principles of green chemistry - consumerism and waste products - environment protection act - Air act - Water act -Wildlife protection act - Forest conservation act - The Biomedical Waste (Management and Handling) Rules; 1998 and amendments - scheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards - disaster management: floods, earthquake - Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India).

HUMAN POPULATION AND THE ENVIRONMENT UNIT V 8 Hours Population growth, variation among nations - population explosion - family welfare programme environment and human health - human rights - value education - HIV / AIDS - women and child welfare -Environmental impact analysis (EIA) - GIS - remote sensing - role of information technology in environment and human health - Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical report).

#### TOTAL: 45 HOURS

#### 10 Hours

10 Hours

#### 9 Hours

8 Hours



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> B.E. - Computer Science and Engineering (E.G.S. Pillay Engineering College (Regulations 2017 Approved in II Academic Council Meeting held on 05-05-2018

### SEMESTER-VI

1701MGX01		PROFESSIONAL ETHICS	L	Т	P	c
			3	0	0	3
PREREQUIS		Basic Understanding of Human Values, Ethical thinking	- 1 a 1 a 41 a		40.00	
COURSE OB	JECTIV	ES:				
	22203000	C-201				
re 2. To et 3. To	sponsibil o unders hical issu o unders	stand personal ethics, legal ethics, cultural associated ethi	uporary			
UNITI		responsibility		1	0.11	ours
	and the second se	Honesty - Integrity - Values - Work Ethic - Civic Virtue - Resp	act for	Other		
		and Sharing - Self-Confidence - Courage - Co-operation - Comm				
UNITI		EERING ETHICS AND PROFESSIONALISM	unnen	- 111		ours
		ring Ethics'- Variety of moral issues - Types of inquiry - J	1 circumtin			
Senses of Sample co	corporat des NSPI	ession and Professionalism - Models of Professional Roles - I e responsibility - Codes of ethics: Importance - justification E - IEEE - Institution of Engineers (India).			- Abı	1se -
UNITII	and the second second	EERING AS SOCIAL EXPERIMENTATION		1	111.007	ours
Cautious o - Bhopal G	ptimism Fas Trage	perimentation - Engineers as responsible experimenters - Balar - Safety and risk - Assessing and reducing risk - Safe exits - The dy - The Three Mile Island and Chernobyl.			case s	study
UNIT IV		PLACE RESPONSIBILITIES AND RIGHTS				ours
climate - 0	Collegial	is - Responsibilities and Duties of Indian Citizens - Teannwo ity and loyalty - Managing conflict - Respect for authority - Conflicts of interest - Occupational crime - Professional rights - En	Collecti	ve ba	rgaini	
UNITV		L ISSUES		1		ours
promoting sentient ce	morally ntred - a	orations: Technology transfer and appropriate technology just measures - Environmental ethics: Engineering, ecology - ec nd bio and eco centric ethics - Computer ethics and internet - E rs - Engineers as expert witnesses and advisors - Moral leadershi	onomio ngineer	cs - H 5 a5 c	lumar nanag	and ers -
		T	otal:		45 H	ours
Further Read	ing:			12202	11.84	
		<ol> <li>Sample code of ethics like IETE, ASME, ASCE, Indian Ins Management.</li> </ol>	titute o	t Mai	renals	
	-	2. Virtues for life				
COURSE OU						
		ompletion of the course, Student will be able to				
COl		ate engineering ethics theory with sustained lifelong learning to ering decisions.	strength	en at	itonor	nous
CO2		example of faith, character and high professional ethics, and abilities, rights of others, public's welfare, health and safety.	cherish	the	workj	place
CO3	Contrib	oute to shape a better world by taking responsible and ethical : iment and the lives of world community.	actions	to in	prove	e the



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1703CS030	8	CYBER FORENS	SICS	L	Τ	P	C
	8			3	0	0	3
PREREQUISIT	E.	Cryptography and Network Security					
COURSE	1.2.7	cryptography and Hetwork Security					
OBJECTIVES:							
	1	1. Learn the security issues network lay	ver and transport	laver.			
		2. Be exposed to security issues of the					
	8	3. Learn computer forensics.		-57			
		4. Be familiar with forensics tools.					
		5. Learn to analyze and validate forens	ies data.				
UNIT I	NET	ORK LAYER SECURITY & TRANS	PORTLAVER	SECURITY		9 H	our
		ntication Header - IP ESP - Key Manag					
		yptographic Computations - TLS Prote					
UNITI		L SECURITY & FIREWALLS	1993		T	9 H	our
PGP - SMIME		Firewalls for Trusted System: Roles of	Firewalls - Firey	wall related to	mine		
		all designs SET for E-Commerce Tra		2446012 CTV922 D04	Grooms		
UNIT III		DUCTION TO COMPUTER FORE			- 8	9 H	our
	dentity ?	Computer Crime, Traditional problem left & Identity Fraud. Types of CF tech indication and investigation. Prenaration	niques - Inciden	t and inciden	t respo		
methodology - F team - Forensics	dentity orensic s Techno		uniques - Inciden n for IR: Creatin puter Investigatio	t and inciden g response to	t respo ol kit :	and IR	
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	CYBER FORENSICS	LTPC 3003
OBJECTIVES:		
The student should b	e made to:	
THE REPORT OF COMPANY OF C	y issues network layer and transport layer	
	curity issues of the application layer	
<ul> <li>Learn computer f</li> </ul>		
<ul> <li>Be familiar with fi</li> </ul>	prensics tools	
<ul> <li>Learn to analyze</li> </ul>	and validate forensics data	
UNIT I NETWOR	K LAYER SECURITY & TRANSPORT LAYER SECURITY	Y 9
IPSec Protocol - IP	Authentication Header - IP ESP - Key Management rity: SSL protocol, Cryptographic Computations – TLS Pro	Protocol for IPSec .
		25
	ECURITY & FIREWALLS emet Firewalls for Trusted System Roles of Firewall	9 Eirouall related
	Firewalls Firewall designs SET for E-commerce Transa	
UNIT III INTRODU	CTION TO COMPUTER FORENSICS	9
Internal colling the Internal's		a side and search in side at
response methodology tool kit and IR team	y Theft & Identity Fraud. Types of CF techniques - I - Forensic ouplication and investigation. Preparation for I Forensics Technology and Systems - Understanding Con	R: Creating response
response methodology tool kit and IR team Data Acquisition.	Forensic ouplication and investigation. Preparation for I Forensics Technology and Systems - Understanding Con CE COLLECTION AND FORENSICS TOOLS	R: Creating response nputer Investigation – 9
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response methodology tool kit and IR team Data Acquisition. UNIT IV EVIDEN Processing Crime an Computer Forensics	Forensic ouplication and investigation. Preparation for I Forensics Technology and Systems - Understanding Con CE COLLECTION AND FORENSICS TOOLS d Incident Sciences - Working with Windows and DO Tools: Software/ Hardware Tools.	R: Creating response nputer Investigation – 9 S Systems. Current
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#### TEXT BOOKS:

- 1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
- 2. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.

#### REFERENCES:

- John R. Vacca, "Computer Forensics", Cengage Learning, 2005
   Richard E.Smith, "Internet Cryptography", 3<sup>rd</sup> Edition Pearson Education, 2008.
   Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3<sup>rd</sup> Edition, Prentice Hall, 2013.



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### GE6083

### DISASTER MANAGEMENT

LTPC 3003

### OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability. disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

#### UNITI INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks - Disasters: Types of disasters -Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

APPROACHES TO DISASTER RISK REDUCTION (DRR) UNITI Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities ofcommunity, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level-State Disaster Management Authority(SDMA) - Early Warning System - Advisories from Appropriate Agencies.

#### UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

#### UNIT IV DISASTER RISK MANAGEMENT IN INDIA

9 Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation - role or GIS and information rechnology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster - Disaster Damage Assessment.

#### UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS



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#### GE6075

PROFESSIONAL ETHICS IN ENGINEERING

LTPC 3 00 3

#### **OBJECTIVES:**

 To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

#### UNIT I HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

#### UNIT II ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

#### UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

#### UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk -Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

#### UNIT V GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility TOTAL: 45 PERIODS

#### OUTCOMES:

Upon completion of the course, the student should be able to apply ethics in society, discuss the
ethical issues related to engineering and realize the responsibilities and rights in the society

#### TEXTBOOKS:

- 1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
- Govindarajan M, Natarajan S, Senthil Kumar V, S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

107

#### REFERENCES:

- 1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
- Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics Concepts and Cases", Cengage Learning, 2009
- 3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
- Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
- 5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity

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### GE6084

HUMAN RIGHTS

#### LTPC 3003

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### OBJECTIVES :

To sensitize the Engineering students to various aspects of Human Rights.

### UNITI

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

### UNIT II

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

### UNIT III

Theories and perspectives of UN Laws - UN Agencies to monitor and compliance.

### UNIT IV

Human Rights in India - Constitutional Provisions / Guarantees.

### UNIT V

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

### OUTCOMES:

Engineering students will acquire the basic knowledge of human rights.

### REFERENCES:

- Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
- 2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
- 3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

87



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#### GE6351

#### ENVIRONMENTAL SCIENCE AND ENGINEERING

LTPC 3003

12

#### **OBJECTIVES:**

To the study of nature and the facts about environment.

- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

#### UNITI ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment - concept of an ecosystem - structure and function of an ecosystem - producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle - energy flow in the ecosystem - ecological succession processes - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to biodiversity definition: genetic, species and ecosystem diversity - biogeographical classification of India - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values -Biodiversity at global, national and local levels - India as a mega-diversity nation - hot-spots of biodiversity - threats to biodiversity; habitat loss, poaching of wildlife, man-wildlife conflicts endangered and endemic species of India - conservation of biodiversity. In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, pirus Field study of simple ecosystems - pond, river, hill slopes, etc.

#### UNIT II ENVIRONMENTAL POLLUTION

10 Definition - causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere formation of smog, PAN, acid rain, oxygen and ozone chemistry.- Mitigation procedures- Control of particulate and gaseous emission, Control of SO2, NOx, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters - physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes - (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards role of an individual in prevention of pollution - pollution case studies - Field study of local polluted site - Urban / Rural / Industrial / Agricultural.

#### UNIT III NATURAL RESOURCES

10 Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and overutilization of surface and ground water, dams-benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes - Biogas - production and uses, anaerobic digestion; case studies - Land resources: Land as a resource, land depradation, man induced landslides, soil erosion and desertification - role of an individual in conservation of natural resources - Equitable use of resources



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for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants. Field study of local area to document environmental assets – river/forest/grassland/hill/mountain.

#### UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

Error uncurtainable to curtainable development when problems related to energy - water conservation, rain water harvesting, watershed management - resettlement and rehabilitation or people, its problems and concerns, case studies - role of non-governmental organizationenvironmental ethics: Issues and possible solutions - 12 Principles of green chemistry- nuclear accidents and holocaust case studies. - wasteland reclamation - consumerism and waste products - environment production act - Air act - Water act - Wildlife protection act - Forest conservation act - The promeorcal waste (wahagement and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark), enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides. Public awareness.

#### UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population evaluation – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -Gra-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

6

#### OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- · Public awareness of environment at infant stage.
- · Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

#### TEXT BOOKS:

- Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2<sup>rd</sup> Edition, Pearson Education 2004.
- 2. Benny Joseph, 'Environmental Science and Engineering', Tata Mc Graw-Hill, New Delhi, 2006.

#### REFERENCES:

- R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standard", Vol. I and II, Enviro Media.
- Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
- 3. Dharmendra S. Sengar, 'Environmental law', Prentice Hall of India PVT LTD, New Delhi, 2007.
- 4. Rajagopalan, R. 'Environmental Studies-From Crisis to Cure', Oxford University Press 2005.



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#### GE6757

#### TOTAL QUALITY MANAGEMENT

#### LTPC 3003

9

#### OBJECTIVES:

To facilitate the understanding of Quality Management principles and process.

#### UNITI INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

81

#### TOM PRINCIPLES UNITI

#### Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

#### UNIT III TQM TOOLS AND TECHNIQUES I

The seven traditional tools of quality - New management tools - Six sigmat Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

#### UNITIV TOM TOOLS AND TECHNIQUES II

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) -Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

#### UNIT V QUALITY SYSTEMS

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing -QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors...

#### OUTCOMES :

 The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

#### TEXTBOOK:

1. Dale H. Besterfiled, et at., "Total guality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.

#### REFERENCES:

- 1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
- Suganthi L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2008.
- 3. Janakiraman. B and Gopal .R.K., "Total Quality Management Text and Cases", Prentice Hall (India) Pvt Ltd 2006

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TOTAL: 45 PERIODS



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#### GE6083

#### DISASTER MANAGEMENT

LTPC 3003

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### OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- · To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- · To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

### UNIT I INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes. Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9 Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities ofcommunity, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level-State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

#### UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

### UNIT IV DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

#### UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS



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Т552	1904I		STARTUP OPPORTUNITIES FOR IT ENGINEERS	L	Т	Р	С
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AIM: T	his cours	se helps y	you understand the process of entrepreneurship from a techno	logy-c	orient	ed	
backgro							
OURS	E OBJE	<b>CTIVES</b> :					
			arn what it takes to become a"technopreneur"				
			plore various methods for identifyingopportunities	. 1. 11.4-	- <b>6</b> 4	1	
		3. Le ide	arn how to conduct market research and provide evidence for the v	lability	or the	e busir	iess
			evelop a viable business proposition and learn to pitch your ideas fo	r vario	usaud	iences	
			iderstand the dynamics of new venture development and teambuild				
			evelop the ability to translate a business idea into marketing and final		lans		
Course	Contents						
1.	Introdu	action toS	tartups				
2.	Innova	tion &En	trepreneurship				
3.	Entrep	reneurial	Mindset, EntrepreneurialSkillset				
4.			EcoSystem				
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6.			tification, Selection & Validation				
7.			chnology & Startups				
8.			nityIdentification				
9.			Trends – Examples				
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2.			roblems, Problem Identification, Selection & Evaluation – 30M	arks			
3.			Review of Business Models of IT based Startups – 20Marks				
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1902MCX03		ESSENCE OF INDIAN TRADITIONAL	L	Т	Р	C
		KNOWLEDGE				
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<b>COURSE OB</b>	JECTIES:					
	1. T	he course aims at imparting basic principles of thought pro-	ocess,	reas	oning	g and
	in	ferencing. Sustainability is at the core of Indian Traditional	Knov	vledg	e Sys	stems
	СС	onnecting society and nature.			•	
	2. H	olistic life style of Yogic-science and wisdom capsules in S	Sanski	rit lite	eratur	e are
	al	so important in modern society with rapid technological advar	nceme	ents a	nd so	cieta
	di	isruptions.				
	3. T	he course focuses on introduction to Indian Knowledge System	n, Ind	ianpe	rspec	tive
	ot	f modern scientific world-view and basic principles of Yog	a and	holi	stic h	lealth
	ca	aresystem.				
1. Basic Struct	ure of Indi	ian Knowledge System				
i) Vedas, (ii)	Uveda (Ay	ruveda, Dhanuveda, Gandhaveda, SthaityaAdad) (iii) Vedang (	Shiks	sha, K	alla,	
Janrut, Gramı	nar, Jyotis	haChhanda), (iv) Uraiga (Dharma Vastra, Shringa, Guarana, T	`irmas	sra)		
		Indian KnowledgeSystem				
3. Yoga and I		ealthcare				
4. CaseStudie	es.					
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COURSE OU	<b>TCOMES</b> :					
		ourse, Student will be able to understand , connect up and explain	basic	s of Ir	ndian	
Traditional kno	wledgemo	dern scientific perspective				

**REFERENCES:** 



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1902MCX02	CONSTITUTION OF INDIA	L	Т	P	C
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Course Content					

#### Course Content

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in manycountries.

The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our ownancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in theworld".

#### **Course content**

- 1. Meaning of the constitution law and constitutionalism
- 2. Historical perspective of the Constitution ofIndia
- 3. Salient features and characteristics of the Constitution ofIndia
- 4. Scheme of the fundamentalrights
- 5. The scheme of the Fundamental Duties and its legalstatus
- 6. The Directive Principles of State Policy Its importance and implementation
- 7. FederalstructureanddistributionoflegislativeandfinancialpowersbetweentheUnionandtheStates

8. Parliamentary Form of Government in India – The constitution powers and status of the President of India

9. Amendment of the Constitutional Powers and Procedure

10. The historical perspectives of the constitutional amendments inIndia

- 11. Emergency Provisions : National Emergency, President Rule, FinancialEmergency
- 12. Local Self Government Constitutional Scheme inIndia
- 13. Scheme of the Fundamental Right toEquality
- 14. Scheme of the Fundamental Right to certain Freedom under Article19
- 15. Scope of the Right to Life and Personal Liberty under Article21



NAGAPATTINAM – 611 002. TAMILNADU, INDIA

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA)

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1901MCX01	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	С
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	(For B.E.,BME)			Ů	
Course Objective			I	1 1	
2	1. To study the nature and facts about environment.				
	2. To finding and implementing scientific, technological, economic and	d polit	ical so	lutions	to
	environmental problems	1			
	3. To study the interrelationship between living organism and environm	nent.			
	4. To appreciate the importance of environment by assessing its impact		e hum	an wor	ld:
	envision the surrounding environment, its functions and its value.				,
	5. To study the dynamic processes and understand the features of the ea	arth''s	interio	or and	
	surface				
UNIT I				91	Hours
	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY and importance of environment – need for public awareness - concept of an e	2000110	tom		
	cosystem – producers, consumers and decomposers – energy flow in the				
	L chains, food webs and ecological pyramids – Introduction, types, characterist				
	(a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aqu				
	ivers, oceans, estuaries) – Introduction to biodiversity definition: genetic,				
	ographical classification of India – value of biodiversity: consumptive use				
	and option values – Biodiversity at global, national and local levels – India as				
	iodiversity - threats to biodiversity: habitat loss, poaching of wildlife, 1				
endangered and e	ndemic species of India - conservation of biodiversity: In-situ and ex-situ con				ersitv
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	nmon plants, insects, birds; Field study of simple ecosystems – pond, river, hil				cibity
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NAGAPATTINAM - 611 002. TAMILNADU, INDIA

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(Accredited by NAAC with 'A' Grade and NBA) Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

	Analyze the continuous pollution signals & systems and its biosignal applications
<b>Course Outcon</b>	es:
	After completion of the course, Student will be able to
	1. Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection.
	2. Public awareness of environmental is at infant stage.
	3. Development and improvement in std. of living has lead to serious environmental disasters
	4. Ignorance and incomplete knowledge has lead to misconceptions
Text Book:	
1. Benny	oseph, _Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
<b>2.</b> Gilbert 2004.	M.Masters, _Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education,
References:	
1. Benny J	oseph, Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Dharme	ndra S. Sengar, Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
3. 2. Eracl	Bharucha, —Textbook of Environmental Studiesl, Universities Press(I) PVT, LTD, Hydrabad, 2015
4. Rajagor	alan, R, _Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
	Miller and Scott E. Spoolman, -Environmental Sciencel, Cengage Learning India PVT, LTD, Delhi,



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1902BM404	<b>BIOMEDICAL INSTRUMENTATION</b>	L	Т	Р	С	
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Course Objectives:					1	
	ic theory of Bio potential Electrodes and Bio potential measurem	ent.				
	ign of Bio potential amplifiers.					
3. To know about bioeled	ctric signals and amplifiers					
4. To analyse the biomed	lical recording systems					
	electrical physiological measurement and bio chemical measurer	nents.				
	NTIAL ELECTRODES 9 Hours					
Origin of bio potential and i	ts propagation. Electrode-electrolyte interface, electrode-skin in	terfac	e, hal	f-cell	poter	ntial,
	tion effects of electrode - non polarizable electrodes. Types of e					
	heir equivalent circuits. Recording problems - motion artifact	s, me	easure	ment	with	two
electrodes.						
		Hours		12.1	1	
	- frequency and amplitude ranges. ECG – Einthoven's triangle raphy.EEG – 10-20 electrode system, unipolar, bipolar and aver					
and bipolar mode. Recording	aphy.EEG = 10-20 electrode system, unipolar, orporar and aver-	age n	loue.	LINIO	– um	Joiai
UNIT III BIOELECTRIC	C AMPLIFIERS 9 Hours					
	gle ended bio-amplifier, differential bio-amplifier, Impedance	matcl	ning c	ircuit	. isol	ation
	optical isolation - isolated DC amplifier and AC carrier amplifie					
Right leg driven ECG amplif		,				,
UNIT IV MEASURE	MENT OF NON-ELECTRICAL PARAMETERS9 HoursTe	mper	ature,	respi	ration	rate
	ts. Blood Pressure: indirect methods -Auscultatory method, os					
methods: electronic manome	eter, Pressure amplifiers, Systolic, diastolic, mean detector circu	it. Bl	ood fl	ow a	nd car	rdiac
output measurement: Indicate	or dilution, thermal dilution and dye dilution method, Electromag	netic	and u	ltraso	und b	lood
flow measurement.						
UNIT V	PATIENT MONITORING SYSTEMS					ours
	nonitor-selection of system parameters, Bedside monitors, Ce					
	sphygmomanometers- Holtermonitor and Cardiac stress te	net (	`ardia		at a min	· ·
instrumentation-Organizatio		<i>s</i> , c	aruia	c ca	uteriz	ation
	n and equipment used in ICCU & ITU.		aruta	c ca		
				c ca	45 H	
Further Reading:	n and equipment used in ICCU & ITU.					
Medical Imaging,Bio	n and equipment used in ICCU & ITU.					
Medical Imaging,Bio Course Outcomes:	n and equipment used in ICCU & ITU.  I ot medical Image Processing.					
Medical Imaging,Bio Course Outcomes: After completion of the cou	n and equipment used in ICCU & ITU.  I ot medical Image Processing.  urse, Student will be able to	al:				
Medical Imaging,Bio Course Outcomes: After completion of the cou 1. Comprehend and app	n and equipment used in ICCU & ITU.  I ot  medical Image Processing.  urse, Student will be able to reciate the significance and role of this course in the present cont	al:				
<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the cout</li> <li>Comprehend and app</li> <li>Describe the fundamed</li> </ul>	n and equipment used in ICCU & ITU.  I ot  medical Image Processing.  urse, Student will be able to reciate the significance and role of this course in the present cont entals of Bio potential recording.	al:				
Medical Imaging,Bio Course Outcomes: After completion of the cou 1. Comprehend and app 2. Describe the fundame 3. Design various bio ar	n and equipment used in ICCU & ITU.  I ot medical Image Processing.  Irse, Student will be able to reciate the significance and role of this course in the present cont entals of Bio potential recording. nplifiers.	al:				
<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the courting</li> <li>Comprehend and app</li> <li>Describe the fundame</li> <li>Design various bio article</li> <li>Measure various physical</li> </ul>	n and equipment used in ICCU & ITU.  I ot  medical Image Processing.  reciate the significance and role of this course in the present cont entals of Bio potential recording. nplifiers. siological and bio chemical parameters	al:				
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<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the cou</li> <li>Comprehend and app</li> <li>Describe the fundame</li> <li>Design various bio ar</li> <li>Measure various phys</li> <li>Understand the conce</li> <li>Text Book:         <ol> <li>Joseph J. Carr and Josed</li> <li>Edition, 2014.</li> </ol> </li> </ul>	n and equipment used in ICCU & ITU.  I ot  medical Image Processing.  urse, Student will be able to reciate the significance and role of this course in the present cont entals of Bio potential recording. nplifiers. siological and bio chemical parameters pts of patient monitoring systems hn M. Brown, "Introduction to Biomedical equipment technology	al:	rary v	vorld.	45 H	ours
<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the cou</li> <li>Comprehend and app</li> <li>Describe the fundame</li> <li>Design various bio ar</li> <li>Measure various phys</li> <li>Understand the conce</li> <li>Text Book:         <ol> <li>Joseph J. Carr and Josed</li> <li>Edition, 2014.</li> </ol> </li> </ul>	n and equipment used in ICCU & ITU.  I ot  medical Image Processing.  reciate the significance and role of this course in the present cont entals of Bio potential recording. nplifiers. siological and bio chemical parameters epts of patient monitoring systems	al:	rary v	vorld.	45 H	ours
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<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the cou</li> <li>Comprehend and app</li> <li>Describe the fundame</li> <li>Design various bio ar</li> <li>Measure various physis</li> <li>Understand the conce</li> <li>Text Book:</li> <li>Joseph J. Carr and Job Edition, 2014.</li> <li>R.S.Khandphur, "Ha</li> <li>References:</li> <li>John G.Webster, "M Edition, 2009.</li> </ul>	n and equipment used in ICCU & ITU.	al: empo /", Pe	rary w arson	vorld. Educ	45 H ation,	ours
<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the cou</li> <li>1. Comprehend and app</li> <li>2. Describe the fundame</li> <li>3. Design various bio ar</li> <li>4. Measure various phys</li> <li>5. Understand the conce</li> <li>Text Book:</li> <li>1. Joseph J. Carr and Job Edition, 2014.</li> <li>2. R.S.Khandphur, "Ha</li> <li>References:</li> <li>1. John G.Webster, "M Edition, 2009.</li> <li>2. Khandpur R.S, "Hand</li> </ul>	n and equipment used in ICCU & ITU.  I ot  medical Image Processing.  urse, Student will be able to reciate the significance and role of this course in the present cont entals of Bio potential recording.  mplifiers. siological and bio chemical parameters pts of patient monitoring systems  hn M. Brown, "Introduction to Biomedical equipment technology andbook on Biomedical Instrumentation", 2014  fedical Instrumentation Application and Design", John Wiley	al: empo /", Pe and S Delhi,	rary v arson ons, 3rd E	vorld. Educ New	45 H ation, York	ours
<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the cou</li> <li>1. Comprehend and app</li> <li>2. Describe the fundame</li> <li>3. Design various bio ar</li> <li>4. Measure various physical</li> <li>5. Understand the conce</li> <li>Text Book:</li> <li>1. Joseph J. Carr and Job Edition, 2014.</li> <li>2. R.S.Khandphur, "Ha</li> <li>References:</li> <li>1. John G.Webster, "M Edition, 2009.</li> <li>2. Khandpur R.S, "Hand</li> </ul>	n and equipment used in ICCU & ITU.  I ot  medical Image Processing.  reciate the significance and role of this course in the present cont entals of Bio potential recording. nplifiers. siological and bio chemical parameters pts of patient monitoring systems hn M. Brown, "Introduction to Biomedical equipment technology ndbook on Biomedical Instrumentation", 2014 fedical Instrumentation Application and Design", John Wiley Baker, "Principles of Applied Biomedical Instrumentation", Johr	al: empo /", Pe and S Delhi,	rary v arson ons, 3rd E	vorld. Educ New	45 H ation, York	ours
<ul> <li>Medical Imaging,Bio</li> <li>Course Outcomes:</li> <li>After completion of the courting</li> <li>Comprehend and app</li> <li>Describe the fundame</li> <li>Design various bio article</li> <li>Measure various physical</li> <li>Understand the concernet</li> <li>Text Book:</li> <li>Joseph J. Carr and Job Edition, 2014.</li> <li>R.S.Khandphur, "Hat</li> <li>References:</li> <li>John G.Webster, "M Edition, 2009.</li> <li>Khandpur R.S, "Hand</li> <li>L.A Geddes and L.E. Edition, Reprint 2008</li> </ul>	n and equipment used in ICCU & ITU. I ot medical Image Processing. urse, Student will be able to reciate the significance and role of this course in the present cont entals of Bio potential recording. mplifiers. siological and bio chemical parameters epts of patient monitoring systems hn M. Brown, "Introduction to Biomedical equipment technology andbook on Biomedical Instrumentation", 2014 fedical Instrumentation Application and Design", John Wiley dbook of Biomedical Instrumentation", Tata McGraw Hill, New I Baker, "Principles of Applied Biomedical Instrumentation", Johr 3. d J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and N	al: empo /", Pe and S Delhi,	arson arson <u>3rd E</u> y and	vorld. Educ New Edition Sons	45 H 45 H ation, York <u>n, 201</u> , 3rd	ours



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1902BM603		Biomaterials	L	Т	P	С	
			3	0	0	3	
Course Objectiv	ves:	The student should be made to:					
	1.	To Learn characteristics and classification of Biomaterials					
	2.	TioUnderstand different metals, ceramics and its nanomaterials	s chara	cteristi	cs as		
_	biomaterials						
	3.	To Learn polymeric materials and its combinations that could be	be used	l as a ti	ssue		
-		replacement implants					
	4.	To Get familiarized with the concepts of Nano Science and Tec					
	5.	To Understand the concept of biocompatibility and the method	s for b	iomate	rials		
<b>T</b> T • / <b>T</b>		testing			0.11		
Unit I	1:£	INTRODUCTION TO BIO-MATERIALS		: - 1f		ours	
		tion of bio-materials, mechanical properties, visco elasticity, bio		ial peri	orman	ce,	
Unit II	o impian	ts, wound healing, blood compatibility, Nano scale phenomena.	1		0.11	0.11.110	
	ta Stair	METALLIC AND CERAMIC MATERIALS nless steels, co-based alloys, Ti-based alloys, shape memory allo		octurat		ours	
		dation and corrosion, ceramic implant – bio inert, biodegradable					
		eation and corrosion, ceramic implant – bio mert, biodegradable	01 010	1030108	ion <b>c</b> ,		
Unit III		POLYMERIC IMPLANT MATERIALS			9 H	ours	
	factors	influencing the properties of polymers, polymers as biomaterials	s. biode	egradab		5413	
		: Collagen, Elastin and chitin. Medical Textiles, Materials for op				ct	
		embranes for plasma separation and Blood oxygenation, electro					
approach.		1 1 58 7	1	0			
Unit IV		TISSUE REPLACEMENT IMPLANTS			9 H	ours	
Small intestinal	sub muc	cosa and other decullarized matrix biomaterials for tissue repair:	Extra	cellula	r Matri	ix.	
		sutures, surgical tapes, adhesive, Percutaneous and skin implan					
		grafts, hard tissue replacement Implants, joint replacements, tiss					
engineering usin					0		
Unit V		TESTING OF BIOMATERIALS			9 H	ours	
Biocompatibility	y, blood	compatibility and tissue compatibility tests, Toxicity tests, sensi	itizatio	n,			
		nicity and special tests, Invitro and Invivo testing; Sterilisation of			d devi	ces:	
	-	autoclaving. Effects of sterilization.	-				
		Total:			45 H	ours	
Further Rea	ading:						
Biopolymers							
<b>Course Outcom</b>	nes:						
	At the	end of the course, the student should be able to					
	1.	Analyze different types of Biomaterials and its classification and	nd app	ly the c	oncep	t of	
		nanotechnology towards biomaterials use.					
	2.		arther of	develop	ment	in	
		metallic and ceramic materials					
	3.		urther	develop	oment	in	
		polymeric materials					
_	<u> </u>						
	4.	Create combinations of materials that could be used as a tissue	replac	ement	ımplar	ıt.	
	5.	Understand the testing standards applied for biomaterials.					
Toxt hooks.	1						



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2. Sreera	m Ramakrishna, MuruganRamalingam, T. S. Sampath Kumar, and Winston O. Soboyejo,
—Bior	naterials: A Nano Approachl, CRC Press, 2010
<b>References:</b>	
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2.	John Enderle, Joseph D. Bronzino, Susan M.Blanchard, -Introduction to Biomedical
	Engineering, Elsevier, 2005.
3.	Park J.B., —Biomaterials Science and Engineeringl, Plenum Press, 1984.
4.	A.C Anand, J F Kennedy, M.Miraftab, S.Rajendran,-Woodhead Medical Textiles and
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	A comprehensive Treatment Volumel, VCH Publishers 1992.
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1902BM502		MEDICAL OPTICS	]	L	Т	Р	С
				3	0	0	3
<b>Course Objectiv</b>							
		otical properties of the tissues and the interactions of light w	rith tissues				
		e instrumentation and components in Medical Optics.					
		fedical Lasers and their applications					
		tical diagnostic applications rging optical diagnostic and therapeutic techniques					
5 10 KIIOV	v the ente	igning optical diagnostic and incrapeutic techniques					
UNIT I		AL PROPERTIES OF THE TISSUES					ours
		sorption, light transport inside the tissue, tissue properties, I uorescence, speckles.	light intera	actio	n with	tissues	,
UNIT II	INSTR	UMENTATION IN PHOTONICS				9 H	ours
Instrumentation	for absor	otion, scattering and emission measurements, excitation ligh				sure ar	
	LEDs, L	asers, optical filters, polarizer, solid state detectors, time res	olved and	phas	se resol	ved	
detectors.						0.11	
UNIT III Lasers in onbtha		CATIONS OF LASERS Dermatology, Dentistry, Urology, Otolaryngology, Tissue v	velding an	d Sc	Iderin		ours
-				u st	Jucing	-	
UNIT IV		AL TOMOGRAPHY				-	ours
Optical coherenc imaging.	e tomogi	aphy, Elastrography, Doppler optical coherence tomograph	y, Applicat	tion	toward	s clini	cal
UNIT V	SPECI	AL OPTICAL TECHNIQUES				9 H	ours
Near field imagin	ng of bio	ogical structures, in vitro clinical diagnostic, fluorescent sp	ectroscopy	, ph	otodyn	amic	
therapy.	U		17	1	,		
		Total:				45 H	ours
Further Readin	g:	I Otuli.				10 11	ours
• Learn al	bout lase	r Characteristics as applied to medicine and biology gnostic applications					
		5 11					
<b>Course Outcom</b>							
		the students should be able to:					
		wledge of the fundamentals of optical properties of tissues	minotions				
		ponents of instrumentation in Medical Photonics and Config applications of lasers.	gurations				
		es and its diagnostic applications.					
		ging techniques in medical optics					
		· - · ·					
Text Books:	D' 1		2014				
		Biomedical Photonics – Handbookl, CRC Press, Bocaraton,		<i>.</i> .	2002	,	
2. Paras N.	Prasad,	-Introduction to Biophotonics, A. John Wiley and Sons, I	nc. Publica	ation	is, 2003	5	
<b>References:</b>							
	H.Niemz	, -Laser-Tissue Interaction Fundamentals and Application	sl, Springe	er, 20	007		
		-Therapeutic Lasers – Theory and practice, Churchill Livi				Editior	1-
2001.			<b>U</b> 1				
	oldman, N ers Inc., 1	1.D., &R.James Rockwell, Jr., —Lasers in Medicinel, Gord 975.	on and Bro	each	, Scien	ce	



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		Nanotechnology in Medicine	L	Т	Р	C
	_		3	0	0	3
Course Objecti		(For B.E.,BME) The student should be made to:				
Course Objecti	ives:					
	1.	Learn various concepts of nanomedicine.				
	2.	Understandnanobiomaterials and its biocompatibility				
	3.	Know principles of bionanotechnology and nanostructures. Introduction				TT .
UNIT I	1 D			6.0.1		Hou
Introduction ar	na Ka	ationale for Nanotechnology in Cancer Therapy - Passive Targe rinciples and Physicochemical Aspects of Delivery Systems - Active	ting (	oi Sol	lla Iu Stratac	imor
		on Potential Nanotechnology Applications Nanobiotechnology in Dr				
		itics – Nano suspension Formulations Viruses as Nanomaterials for Dr				osea
UNIT II		Nanobiomaterials And Biocompatibility				Hou
	ilk Pro	perties of Bio materials – Nanobiomaterials – NanoCeramics – Nanop	olyme	ers – N	ano S	ilica
		arbon Based nanomaterials Surface modification - Textured and Por				
		ecules - Cell-biomaterial interactions - immune response - In Vitro an				
tissue compatib	oility					
UNIT III		Structural & Functional Principles Of Bio Nano technology				Hou
		nes-Phytosomes, Polysacharides – Peptides –Nucleic acids – DNA				
		:: linear, rotary mortors – Immunotoxins – Membrane transporters an	d pun	ps - A	Antibo	dies
	ntibodi	es – immunoconjugates – limitations of natural biomolecules				п.
UNIT IV		Protein And DNA Based Nanostructures and assembly – lipid chips – S – Layers as Templates – engineered na				Hou
		-based Metallic Nanowires and Networks, DNA–Gold-Nanoparticle C			INA-P	Tote
ivanosti uctures			Online	ratec		
			Conjug	gates	9	Нош
UNIT V		Nano Bio-Analytics				
UNIT V Luminescent Q	uantu	Nano Bio-Analytics m Dots for Biological Labeling – Nanoparticle Molecular Labels – Su	urface	Biolog	gy: An	alys
UNIT V Luminescent Qu of Biomolecula	uantu ar St	Nano Bio-Analytics m Dots for Biological Labeling – Nanoparticle Molecular Labels – Su ructure by Atomic Force Microscopy and Molecular Pulling –	urface Force	Biolog e Spe	gy: An	alys opy
UNIT V Luminescent Qu of Biomolecula Biofunctionaliz	uantu ar St zed Na	Nano Bio-Analytics m Dots for Biological Labeling – Nanoparticle Molecular Labels – Su	urface Force	Biolog e Spe	gy: An	alys opy
UNIT V Luminescent Qu of Biomolecula Biofunctionaliz Bioconjugated S	uantu ar St zed Na Silica	Nano Bio-Analytics           m Dots for Biological Labeling – Nanoparticle Molecular Labels – Suructure by Atomic Force Microscopy and Molecular Pulling –           anoparticles for Surface – Enhanced Raman Scattering and Surface	urface Force Plas	Biolog e Spe	gy: An ctrosco Resona	nalys: opy ince
UNIT V Luminescent Qu of Biomolecula Biofunctionaliz Bioconjugated S Further Readin	Quantu lar St zed Na Silica	Nano Bio-Analytics           m Dots for Biological Labeling – Nanoparticle Molecular Labels – Suructure by Atomic Force Microscopy and Molecular Pulling –           anoparticles for Surface – Enhanced Raman Scattering and Surface           Nanoparticles for Bioanalytical Applications	urface Force Plas	Biolog e Spee mon F	gy: An ctrosco Resona	nalys opy ince
UNIT V Luminescent Qu of Biomolecula Biofunctionaliz Bioconjugated S Further Readin Nanorobots in N	uantu ar St zed Na Silica ings:	Nano Bio-Analytics           m Dots for Biological Labeling – Nanoparticle Molecular Labels – Suructure by Atomic Force Microscopy and Molecular Pulling –           anoparticles for Surface – Enhanced Raman Scattering and Surface	urface Force Plas	Biolog e Spee mon F	gy: An ctrosco Resona	nalys opy ince
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UNIT V Luminescent Qu of Biomolecula Biofunctionaliz Bioconjugated S Further Readin Nanorobots in N	uantu lar St zed Na Silica ings: Medic nes: Aft	Nano Bio-Analytics           m Dots for Biological Labeling – Nanoparticle Molecular Labels – Suructure by Atomic Force Microscopy and Molecular Pulling – anoparticles for Surface – Enhanced Raman Scattering and Surface Nanoparticles for Bioanalytical Applications           ine,Nanoparticles in Medicine           er completion of the course, Student will be able to	Irface Force Plas	Biolog e Spee mon F	gy: An ctrosco Resona	nalys opy ince
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Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai (Accredited by NAAC with 'A' Grade and NBA) Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

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Email: principal@egspec.orgwebsite: www.egspec.orgPh: 04365-251112

1.	Khandpur, R.S., "Handbook of Analytical Instruments", Tata McGraw-Hill publishing Co. Ltd., 2nd Edition 2007.
2.	Ewing, G.W., "Instrumental Methods of Chemical Analysis", McGraw-Hill, 5th Edition reprint 1985.
	(Digitized in 2007).

3. NPTEL lecture notes on, "Modern Instrumental methods of Analysis" by Dr.J.R. Mudakavi, IISC, Bangalore.

1903BM014	CLIMATE CHANGE	AND ITS IMPACT		L	Т	Р	С
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	(For B.E.,	BME)					
Course Objectiv		.1 1 1					
-	1. To understand the basics of						
	2. To have an insight on Atmo						
	3. To develop simple climate r		mate chang	ges us	ing m	odels	
	4. To impart knowledge on the	e global warming					
	5. To Identify the impact of cli	imate change on society	у				
UNIT I	INTRO	DUCTION				91	Hours
	ther and Climate – climate parameters - no and its effect – Carbon cycle	– Temperature, Rainfal	ll, Humidit	y, Wi	nd – C	Blobal	ocean
UNIT II		RIC DYNAMICS:				91	Hours
	nics: law – isobaric heating and coolin		es equati	ion of	motic		
	press – Relative and absolute acceleration						
	by;- Thermal winds -departures – smal						
	n – energy balance -terrestrial radiat						
	1 budget -radiative fluxes – heat tran						
	rface and boundary layer – smaller scale						g anu
UNIT III		L CLIMATE	ger scale wo	cather	syste		Hours
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	<ol> <li>understanding on the growing scientific consensus established through the IPCC as well as the complexities and uncertainties</li> </ol>
Text Books:	
1. Fundame	entals of weather and climate (2nd Edition) Robin Moilveen (2010), Oxford University Press
2. Climate	change and climate modeling, J. David Neelin (2011) Cambridge University press.
References:	
1. Global C	Climate Change and Human Health: From Science to Practice George Luber (Editor), Jay Lemery
(Editor)	ISBN: 978-1-118-50557-1 November 2015, Jossey-Bass

2. ErachBharucha, —Textbook of Environmental Studiesl, Universities Press(I) PVT, LTD, Hydrabad, 2015.

1903BM0007		Telehealth Technology	L	Т	Р	С
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		(For B.E.,BME)	5	Ū	U	
Course Objectiv	es:	The student should be made to:		I		
eourse objectiv		To Learn the key principles for telemedicine and health.				
		To Understand telemedical technology.				
		To Know telemedical standards, mobile telemedicine and it appli	cation	s		
		To understand themobile telemedicine concepts.	cutton			
		To observe the Telemedicine Applicatilons and services.				
UNIT I		TELEMEDICINE AND HEALTH			91	Hours
	Evol	ution of telemedicine, Functional diagram of telemedicine system, Te	lemed	icine		
		care, Organs of telemedicine, Global and Indian scenario, Ethical and				
		- Confidentiality, Social and legal issues, Safety and regulatory issues				
Telemedicin		Confidentiality, Social and legal issues, Safety and regulatory issues	, 1 1 4 7 4			
UNIT II		TELEMEDICAL TECHNOLOGY			91	Hours
	time	dia - Text, Audio, Video, data, Data communications and networks, PST	N.POT	S.		iours
		Air/ wireless communications: GSM satellite, and Micro wave, Modulati		~,		
		Antenna, Integration and operational issues, Communication infrastructur				
		nd WAN technology. Satellite communication. Mobile hand held devices				
		n. Internet technology and telemedicine using world wide web (www). V		ıd		
audio conferencia	ng. C	linical data – local and centralized.				
UNIT III		TELEMEDICAL STANDARDS			91	Hours
		ndards: Encryption, Cryptography, Mechanisms of encryption, phases of				
		: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series (V				
		. 120, H.324 (Video phone based PSTN), Video Conferencing, Real-time				
		ing doctors / Hospitals, Clinical laboratory data, Radiological data, and or	ther			
		iomedical data, Administration of centralized medical data, security and				
	medi	cal records and access control, Cyber laws related to telemedicine.				
		MOBILE TELEMEDICINE		┓┘	91	Hours
		ition, Basic parts of teleradiology system: Image Acquisition system Disp				
		y, multimedia databases, color images of sufficient resolution, Dynamic 1				
		pression methods, Interactive control of color, Medical information stora		l		
		nedicine- patient information medical history, test reports, medical images nt. Hospital information system - Doctors, paramedics, facilities available				
Pharmaceutical in			·•			
UNIT V		TELEMEDICAL APPLICATIONS			91	Hours
		o health care services – health education and self care. · Introduction to				iouis
		urgery. Telecardiology, Teleoncology, Telemedicine in neurosciences,				
		tion, e-health services security and interoperability., Telemedicine access	: to			
		health education and self care, Business aspects - Project planning and	0			

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		Total:	45 Hours
<b>Course Outcomes:</b>			
	After completion of the course, Student wi		
	Apply multimedia technologies in telemed		
	Explain Protocols behind encryption techn	iques for secure transmission of data.	
A	Apply telehealth in healthcare.		
u	inderstand themobile telemedicine concep	ts	
Т	To observe the Telemedicine Applicatile	ns and services.	
<b>Further Readings:</b>	**		
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
Text Books:			
1. Norris, A.C	C. "Essentials of Telemedicine and Teleca	re", Wiley, 2002	
<b>Reference Books</b>			
	R., Craig, J., Patterson, V. (Eds.), "Introdu	ction to Telemedicine. Royal Society of	
	ss Ltd, Taylor & Francis 2006		
2. O'Carroll, I	P.W., Yasnoff, W.A., Ward, E., Ripp, L.H	., Martin, E.L. (Eds), "Public Health Informati	cs
	n Systems", Springer, 2003.		
3. Ferrer-Roc	a, O., Sosa - Iudicissa, M. (Eds.), Handbo	ok of Telemedicine. IOS Press (Studies in	
Health Technol	logy and Informatics, Volume 54, 2002.		
4. Simpson, V	W. Video over IP. A practical guide to tech	nology and applications. Focal Press	
Elsevier, 2006.			
5. Bemmel, J.	H. van, Musen, M.A. (Eds.) Handbook of	Medical Informatics. Heidelberg, Germany:	
Springer, 1997.			
6 MohanBansa	l, "Medical Informatics", Tata McGraw-H	211 2004	



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1902BM702		REHABILITATION ENGINEERING	L	Т	P	С
			3	0	0	4
Course Objecti						
		velop an understanding of the various rehabilitation aids so as to ena		ne stude	nt.	
		esign and apply them with confidence, to help the challenged people				
	3. To u	nderstand the Electronic oriented Mobility Aids				
	4. To st	udy the Auditory and speech devices				
	5. To u	nderstand the Visual sensory sytem and Augumentation				
∐nit I		INTRODUCTION TO REHABILITATION			9 H	ours
	ept of Re	habilitation: Types of Physical Impairments, Principles of Assistive	Tech	nology		11.5
		Rehabilitation Engineering- Key Engineering Principles, Key Ergor			oles.	
		Sensory & Motor rehabilitation		1	, ,	
Unit II		RTHOTICS & PROSTHETICS IN REHABILITATION			9 H	ours
		O,KAFO,HKAFO and prosthesis, Partial Foot Prostheses- Foot-ank	le ass	embly,		2
		hetic Hand, Advance and automated prosthetics and orthosis, Extern				
Controlled ortho	otics & pro	osthetics, -FES system, Restoration of Hand function, Restoration of	f stand	ling and	l walki	ng.
Unit III		MOBILITY AIDS			9 H	ours
Electronic Trave	el Appliar	ices (ETA) : Path Sounder, Laser Cane, Ultrasonic Torch, Sonic Gui	ide, Li	ight Pro	bes,	
Nottingham Obs	stacle Sen	sors, Electro cortical Prosthesis, Polarized Ultrasonic Travel aids, M	lateria	ls used	for wh	eel
chairs, Type of	Wheel Ch	airs, design of wheel Chair, Walking frames, Parallel bars, Rollators	s, Qua	dripods	, Tripo	ds
0 11 1	$\alpha + 1$					
& walking stick	s, Crutche					
Ŭ	s, Crutche	AUDITORY AND SPEECH ASSIST DEVICES			9 H	ours
Unit IV			e syntł	nesizer,	,	0 0 10
Unit IV Types of deafne		AUDITORY AND SPEECH ASSIST DEVICES	e syntł	nesizer,	,	0 0 10
Unit IV	ss, hearin	AUDITORY AND SPEECH ASSIST DEVICES	e syntł	nesizer,	speech	1
Unit IV Types of deafne trainer Unit V	ss, hearin	AUDITORY AND SPEECH ASSIST DEVICES g aids, application of DSP in hearing aids, Cochlear implants, Voice	-		speech 9 H	ours
Unit IV Types of deafne trainer Unit V Classification of	ss, hearin S	AUDITORY AND SPEECH ASSIST DEVICES         g aids, application of DSP in hearing aids, Cochlear implants, Voice         SENSORY AUGMENTATION AND SUBSTITUTIONS	menta	tion, Ta	speech 9 H actile v	ours
Unit IV Types of deafne trainer Unit V Classification of	ss, hearin S	AUDITORY AND SPEECH ASSIST DEVICES         g aids, application of DSP in hearing aids, Cochlear implants, Voice         ENSORY AUGMENTATION AND SUBSTITUTIONS         npairments, Prevention and cure of visual impairments, Visual Augr	menta	tion, Ta	speech 9 H actile v	ours
Unit IV Types of deafne trainer Unit V Classification of substitution, aud	ss, hearin S	AUDITORY AND SPEECH ASSIST DEVICES         g aids, application of DSP in hearing aids, Cochlear implants, Voice         ENSORY AUGMENTATION AND SUBSTITUTIONS         npairments, Prevention and cure of visual impairments, Visual Augr	menta	tion, Ta	speech 9 H actile v	ours ision
Unit IV Types of deafne trainer Unit V Classification of substitution, aud impaired	ss, hearin S Visual In litory sub:	AUDITORY AND SPEECH ASSIST DEVICES         g aids, application of DSP in hearing aids, Cochlear implants, Voice         ENSORY AUGMENTATION AND SUBSTITUTIONS         npairments, Prevention and cure of visual impairments, Visual Augr         stitution and augmentation, tactile auditory substitution, Assistive de	menta	tion, Ta	speech 9 H actile v visual	ours
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Unit IV Types of deafne trainer Unit V Classification of substitution, aud impaired Further Readir	ss, hearin Ss, hearin Visual If litory subs Acquire nes: 1.Adapt	AUDITORY AND SPEECH ASSIST DEVICES         g aids, application of DSP in hearing aids, Cochlear implants, Voice         ENSORY AUGMENTATION AND SUBSTITUTIONS         npairments, Prevention and cure of visual impairments, Visual Augr         stitution and augmentation, tactile auditory substitution, Assistive de         E experience in building and trouble-shooting simple electronic analog         t at using various methods of circuit analysis, including simplified methods	menta evices	tion, Ta for the cuits	speech 9 H actile v visual 45 H	ours ision
Unit IV Types of deafne trainer Unit V Classification of substitution, aud impaired Further Readin	ss, hearin S Visual Ir litory subs Acquire Acquire I.Adap parallel	AUDITORY AND SPEECH ASSIST DEVICES         g aids, application of DSP in hearing aids, Cochlear implants, Voice         ENSORY AUGMENTATION AND SUBSTITUTIONS         npairments, Prevention and cure of visual impairments, Visual Augr         stitution and augmentation, tactile auditory substitution, Assistive de         Total:         e experience in building and trouble-shooting simple electronic analoge         t at using various methods of circuit analysis, including simplified m         reductions, voltage and current dividers, and the node method.	menta evices	tion, Ta for the cuits	9 H 9 H actile v visual 45 H	ours ision ours
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1901MGX007		Universal Human Values and Ethics	L	Т	P	С					
			3	0	0	3					
Course Objecti		ale atradanta diatinarriah hatraan rahaa and aleilla and rus	lausta		haad						
	1. To help students distinguish between values and skills, and understand the need,										
	-	guidelines, content and process of value education.									
		help students initiate a process of dialog within themselves	to kno	ow wha	at they	y					
		want to be' in their life and profession									
		help students understand the meaning of happiness and pros	sperit	y for a	huma	ın					
	being.										
		facilitate the students to understand harmony at all the leve accordingly.	evels (	of hun	nan liv	ving					
		facilitate the students in applying the understanding of ha rofession and lead an ethical life	rmon	y in ex	kisten	ce ir					
Unit I		e Introduction - Need, Basic Guidelines, Content and ss for ValueEducation			9 H	lours					
	1.	Understanding the need, basic guidelines, content an	d pro	ocess	for V	Zalue					
			a pr	50055	101 1	uru					
	2.	Education 2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and									
		eriential Validation- as the mechanism for self exploration	unun 1	recept	unee	und					
	-	Continuous Happiness and Prosperity- A look at basic Hur	nan Δ	snirati	ons						
	<i>J</i> . 4.	Right understanding, Relationship and Physical				2201					
		irements for fulfillment of aspirations of every human be									
	prio	· · ·	Jing v	vitii tii		iicc					
	5	Understanding Happiness and Prosperity correctly- A cr	itical	onnro	ical o	f th					
	J.	ent scenario	nicai	appia	1581 0.	I UI					
	_		tondi	ag and	1 lizzin	in i					
	6.	Method to fulfill the above human aspirations: unders	tanan	ng and	l livin	ig ii					
	harr	nony at various levels									
Unit II	Under	rstanding Harmony in the Human Being - Harmony in			9 H	lour					
		Myself									
	7.	Understanding human being as a co-existence of the sentient 'I'	and th	e mater	rial 'B	odv					
		Understanding the needs of Self ('I') and 'Body' - Sukh and Suv				<i></i>					
		Understanding the Body as an instrument of 'I' (I being the doer		and eni	over)						
		Understanding the characteristics and activities of 'I' and harmo	-		- ) )						
		Understanding the harmony of I with the Body: Sanyam and Sw			ct appi	raisa					
		hysical needs, meaning of Prosperity in detail	5	,	11						
12. Programs t		Sanyam and Swasthya.									
Unit III		nderstanding Harmony in the Family and Society-			9 H	lour					
		Harmony in Human-Human Relationship									
	13.	Understanding harmony in the Family- the basic unit of human i	nterac	tion							
		Understanding harmony in the Family- the basic unit of human i Understanding values in human-human relationship; meaning of			orograi	m fo					



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	15. Understanding the meaning of <i>Vishwas</i> ; Difference between i 16. Understanding the meaning of <i>Samman</i> , Difference between	
	the other salient values in relationship	respect and arreferentiation
	17. Understanding the harmony in the society (society	being an extension o
	family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensi	
	18. Visualizing a universal harmonious order in society- Undivide	
	6	
	Universal Order (SarvabhaumVyawastha) - from family to world	lamity!
Unit IV	Understanding Harmony in the Nature and Existence -	9 Hour
	Whole existence as Co-existence	
	19. Understanding the harmony in the Nature	
	20. Interconnectedness and mutual fulfillment among the four ord	lers of nature- recyclability
	and self-regulation in nature	iers of nature-recyclaoning
	21. Understanding Existence as Co-existence ( <i>Sah-astitva</i> ) of m	utually interacting units is
	all-pervasive space	utually interacting units in
	22. Holistic perception of harmony at all levels of existence	
Unit V	Implications of the above Holistic Understanding of	9 Hour
	Harmony on Professional Ethics	
	23. Natural acceptance of human values	
	24. Definitiveness of Ethical Human Conduct	
	25. Basis for Humanistic Education, Humanistic Constitution	and Humanistic Universa
	Order	
	26. Competence in Professional Ethics:	
	a) Ability to utilize the professional competence for augmentin	ng universal human order
b) At the love	<ul> <li>production systems, technologies and management models</li> <li>27. Case studies of typical holistic technologies, management systems</li> <li>28. Strategy for transition from the present state to Universal Huma) At the level of individual: as socially and ecological technologists and managers</li> <li>1 of society: as mutually enriching institutions and organizations</li> </ul>	nan Order:
b) At the leve		47 1 47 11
E	Total:	45+15 Hour
Further Read	Hundrig: Human values in Public domain	
Course Outco		
	1. Understand the significance of value inputs in a classroom an	nd start applying them in
	their life and profession	
	2. Distinguish between values and skills, happiness and ad	ccumulation of physica
	facilities, the Self and the Body, Intention and Competence of a	
	3. Understand the value of harmonious relationship based on	must and respect in thei
	life and profession	
	4. Understand the role of a human being in ensuring harmony i	n society and nature.
	5. Distinguish between ethical and unethical practices, and	d start working out the
	strategy to actualize a harmonious environment wherever they	-
Text Book		
	, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Va	luce and Professional
T. K K Gaur, Ethics	, K Sangai, O F Dagana, 2009, A Foundation Course in Human Va	nues and Frotessional
ETHICS.		



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#### References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA

2.E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.

3.Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

4.Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

5.A Nagraj, 1998, JeevanVidyaEkParichay, Divya Path Sansthan, Amarkantak.

6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

7. A N Tripathy, 2003, Human Values, New Age International Publishers

8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati

9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press

10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

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12. B L Bajpai, 2004, Indian Ethos and Modern Management.



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#### 1902BM751

### HOSPITAL TRAINING

#### LTPC

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#### **OBJECTIVES:**

#### The student should be made to

- Observe medical professionals at work in the wards and the roles of Allied Health Professionals;
- Provide access to healthcare Professionals to get a better understanding of their work;
- Demonstrate patient-care in a hospital setting.

#### **ASSESSMENT:**

- Students need to complete training in any leading Multi-speciality hospital for a period of 15 days. They need to prepare an extensive report and submit to their respective course incharges during the session.
- Out of the following departments, it is mandatory to complete training in any 10. The students can give a presentation of the remaining departments during laboratory hours.

S.No.	Departments for visit
1	Cardiology
2	ENT
3	Ophthalmology
4	Orthopaedic and Physiotherapy
5	ICU/CCU
6	Operation Theatre
7	Neurology
8	Nephrology
9	Radiology
10	Nuclear Medicine
11	Pulmonology
12	Urology
13	Obstetrics and Gynaecology
14	Emergency Medicine



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15	Biomedical Engineering Department
16	Histo Pathology
17	Biochemistry
18	Paediatric/Neonatal
19	Dental
20	Oncology
21	PAC's
22	Medical Records / Telemetry

## **TOTAL :15 PERIODS**

## **OUTCOMES:**

## At the end of the course, the student should be able to:

- Advocate a patient-centred approach in healthcare
- Communicate with other health professionals in a respectful and responsible manner
- Recognize the importance of inter-professional collaboration in healthcare.
- Propose a patient-centred inter-professional health improvement plan based upon the patient's perceived needs
- Use the knowledge of one's own role and those of other professions to address the healthcare needs of populations and patients served.



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	2. Workout family relationships concepts, ability to visualize clocks & calendar and understand									
	the logic behind a Sequence.									
	3. Calculate concepts of speed, time and distance, understand timely completion using time and									
	work.									
	4. Learners should be able to understand various charts and interpreted data least time.									
	5. Workout puzzles, ability to arrange things in an orderly fashion.									
Reference	s:									
1.	Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills									
	publication, 2016.									
2.	Arun Sharma, 'How to Prepare for Logical Reasoning for CAT', 4th edition, McGraw Hills publication,									
	2017.									
3.	R S Agarwal, 'A modern approach to Logical reasoning', revised edition, S.Chand publication, 2017.									
4.	R S Agarwal, 'Quantitative Aptitude for Competitive Examinations', revised edition, S.Chand									
	publication, 2017.									
5.	Rajesh Verma, "Fast Track Objective Arithmetic", 3 <sup>rd</sup> edition, Arihant publication, 2018.									
6.	B.S. Sijwalii and InduSijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition,									
	Arihnat publication, 2014.									

# Syllabus of courses offered on cross cutting issues

# 1901MCX01ENVIRONMENTAL STUDIESLTPC3000

#### MODULE I ECOSYSTEMS AND BIODIVERSITY

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland

ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the

## MODULE II NĂTURAL RESOURCES

medicinal plants in your native place

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village

## MODULE III ENVIRONMENTAL POLLUTION

# Definition – Source, causes, effects and control measures of: (a) Air pollution - Mitigation procedures- Control of particulate and gaseous emission, Control of SOX, NOx, CO and HC) -Technology for capturing CO2 (metallo organic frame works) (b) Water pollution – Waste water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies. Documentation study of local polluted site – Urban / Rural / Industrial / Agricultural

MODULE IV SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management -environmental ethics: Issues and possible solutions – 12 Principles of green chemistry – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards- disaster management: floods, earthquake- Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India)

# MODULE VHUMAN POPULATION AND THE ENVIRONMENT8 HoursPopulation growth, variation among nations – population explosion – family welfare programme – environment<br/>and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental<br/>impact analysis (EIA) -GIS-remote sensing-role of information technology in environment and human health –<br/>Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical<br/>report)

# 0 0

10 Hours

10 Hours

8 Hours

9 Hours



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1701MGX01		PROFESSIONAL ETHICS	L 3	Т 0	P 0	C 3						
Course Obje	ectives:		5	U	U	5						
course obje	1.To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral											
		lemmas, Professional Ideals and Virtues										
	2.To provid	To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics,										
	Codes of Et	odes of Ethics, Industrial Standards, Exposure to Safety and Risk, Risk Benefit Analysis										
		n idea about the Collegiality and Loyalty, Collective Bargai	0	, Con	fident	iality,						
		ll Crime, Professional, Employee, Intellectual Property Rights										
		an adequate knowledge about MNC"s, Business, Environmen	tal, (	Comp	uter H	Ethics,						
		oral Leadership, sample Code of Conduct.	•11									
TL.º4 T		engineering principles to update and maintain the technical s	Z1110		0.1	<b>T</b>						
Unit I		ERING ETHICS	1 1	1		Hours						
Senses of "En	gineering Et	hics" – Variety of moral issues – Types of inquiry – Moratheory – Gilligan"s theory – Consensus and Controversy	al di	lemm Drofe	as –	Moral						
		nal Ideals and Virtues – Uses of Ethical Theories.	y —	FIOL	:881011	s and						
Unit II		EERING AS SOCIAL EXPERIMENTATION			91	Iours						
		tation – Engineers as responsible Experimenters – Research	h F	thics								
0 0	<b>1</b>	s - A Balanced Outlook on Law – The Challenger Case Study		lines	COL	105 01						
Unit III		R'S RESPONSIBILITY FOR SAFETY			9 F	Iours						
		ent of Safety and Risk – Risk Benefit Analysis – Reducing Ri	sk –	The C								
		sk - Case Studieson Chernobyl, Bhopal MIC and Sterlite copp										
Unit IV		IBILITIES AND RIGHTS			9 H	Iours						
Collegiality an	nd Loyalty –	Respect for Authority - Collective Bargaining - Confiden	tialit	y – 0								
	•	me - Professional Rights - Employee Rights - Intellectual Pr	oper	ty Rig	ghts (I	PR) –						
Discrimination												
Unit V	GLOBAL					Iours						
		s – Business Ethics - Environmental Ethics – Compute										
		t – Weapons Development – Engineers as Managers – Co				eers –						
Engineers as E	expert witnes	ses and Advisors – Honesty – Moral Leadership – Sample Co		Con								
E	1	Tota	u:		45 1	lours						
Further Rea												
		udy on Hiroshima and Nagasaki										
Course Outo												
	<u> </u>	letion of the course, Student will be able to	Г	.1 • 1	•	• 1						
		examine situations and to internalize the need for applying	ng E	thical	prine	ciples,						
		kle with various situations.										
	-	a responsible attitude towards Global issues										
		the societal impact on the products/ projects nding the code of ethics and standards										
		hics in society, discuss the global issues related to engine	oring	rand	reali	za tha						
	responsibilit	ies and rights in the society	ermg	, and	Tean							
<b>References:</b>	-	· ·										
	leddermann,	"Engineering Ethics", Prentice Hall, New Mexico, 1999.										
		and the Conduct of Business", Pearson Education, 2003										



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3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.

4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi 2004

5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

1703MG005		TOTAL QUALITY MANAGEMENT	L	Т	Р	С
			3	0	0	3
Course Object						
1.		n concepts, dimension quality and philosophies of TQM.				
2.		y the TQM principles and itsstrategies.				
3.	To imp	art knowledge on TQM tools for continuous improvement.				
Unit I		DUCTION				lours
		Dimensions of Quality - Quality Planning - Quality costs - Analysis				
		of Total Quality Management - Historical Review - Quality Stateme				
U	1 2	Crosby philosophy - Continuous Process Improvement - JuranTri	logy, 1	PDSA	Cycle	e, 5S,
		OM Implementation				
Unit II	-	RINCIPLES				lours
		dership - Concepts - Role of Senior Management - Quality Council				
	-	of Quality, Customer Complaints, Service Quality, Customer			-	
		on, Empowerment, Teams, Recognition and Reward, Performance				
		Partnering, sourcing, Supplier Selection, Supplier Rating, Rel	ationsh	nip D	evelop	ment,
Performance N	T	Basic Concepts, Strategy, Performance Measure				
Unit III		STICAL PROCESS CONTROL (SPC)				lours
		ty - Statistical Fundamentals - Measures of central Tendency and Di				
-		Control Charts for variables X bar and R chart and attributes I		C, ai	nd u c	harts,
		cess capability, Concept of six sigma - New seven Management tools	;			
Unit IV	TQM T	OOLS			9 E	lours
Benchmarking	- Reasor	ns to Benchmark - Benchmarking Process, Quality Function Deplo	oyment	(QFD	)- Hoi	ise of
Quality, QFD	Process,	and Benefits - Taguchi Quality Loss Function - Total Productive	e Mair	ntenan	ce (TI	PM) -
Concept, Impro	ovement N	Veeds, and FMEA - Stages of FMEA- Casestudies				
Unit V	QUALI	TY SYSTEMS			<b>9</b> E	lours
Concept, Requ	irements	of ISO 9000 and Other Quality Systems - ISO 9000:2000 Qual	ity Sys	stem -	Elem	ents,
Implementation	n of Quali	ty System, Documentation, Quality Auditing, ISO 9000:2005 and 900	01:201	5, ISO	1400	Э.
		Total:			45 E	lours
Further Read	ing:	i				
	1.	Case Study: TQM Quality and Environmental Concepts in real Work	d Appl	icatior	ıs	
	2.	Environment Management system				
Course Outco	mes:					
	After co	mpletion of the course, Student will be able to				
	1.	Understand the concepts, dimension quality and philosophies of TQM	1.			
	2.	Understand the principles of TQM and itsstrategies.				
	3.	Apply seven statistical quality and managementtools				
	4.	Understand TQM tools for continuousimprovement.				



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	5.	Understand the QMS and EMS
References	•	
1.	Rathakrish	nan, Gas Dynamics, 5th edition, PHI Learing Private Limited, 2013.
2.	N. Gupta an Ltd., New I	nd B. Valarmathi, Total Quality Management, Tata McGraw-Hill Publishing Company Pvt. Delhi,2009.
3.	S. Kumar, 7	Fotal Quality Management, Laxmi Publications Ltd. New Delhi,2006
4.	P.N. Muher	jee, Total Quality Management, Prentice Hall of India, New Delhi,2006.
5.	DaleH.Best	erfiled, Total Quality Management, Pearson Education Inc., New Delhi, 2003.
6.	James R. E	vans and William M. Lidsay, The Management and Control of Quality, South- Western2002.

1703MG001	PRINCIPLES OF MANAGEMENT	L	Т	Р	С				
1705010001		3	0	0	3				
Course Object	tives:								
1. To enable the students to study the evolution of Management									
2	· · · · · · · · · · · · · · · · · · ·								
3	To learn the application of the principles in an organization								
Unit I	INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS			9 H					
skills – Evolu	Management – Science or Art – Manager Vs Entrepreneur - Types of managers - tion of Management – Scientific, Human relations , System and contingency a	pproa	ches -	- Тур	es of				
	anization - Sole proprietorship, partnership, Company-public and private culture and Environment – Current trends and issues in Management.	secto	r en	erpris	es -				
Unit II	PLANNING			9 H	ours				
	rpose of planning – Planning Process – Types of planning – Objectives – Setting mises – Strategic Management – Planning Tools and Techniques – Decision maki								
Unit III	ORGANISING			9 H	ours				
Design - Hu	authority – Departmentalization – Delegation of authority – Centralization and Eman Resource Management – HR Planning, Recruitment, Selection, Trainin Management, Career planning and Management.								
Unit IV	DIRECTING			9 He	ours				
satisfaction -	f Individual and Group behaviour – Motivation – Motivation theories – Motivatio Job enrichment – Leadership – Types and theories of leadership – Commun n – Barrier in communication – Effective communication –Communication and IT	icatio							
Unit V	CONTROLLING			9 H	ours				
	rocess of controlling – Budgetary and non-budgetary control techniques – Use of control – Productivity problems and management – Control and performance – I orting.								
	Total:			45 H	ours				
<b>Further Read</b>	ling:								
	1. Decision roles of managers.								
	2. Motivational thoughts.								
Course Outco									
	After completion of the course, Student will be able to								
	1. Explain the elements of Management and Organization.								
	2. Summarize the types, policies, tools and techniques in Planning in Mana	ageme	nt						



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	3. Relate the job design and human resource management in Organizing								
	4. Illustrate the skills of leadership and communication								
	5. Interpret the controlling techniques in Management								
Referenc	es:								
1. S	tephen A. Robbins & David A. Decenzo& Mary Coulter, "Fundamentals of Management" 7 th Edition,								
F	Pearson Education, 2011.								
2. S	tephen P. Robbins & Mary Coulter, "Management", 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.								
3. F	Robert Kreitner Mamata Mohapatra, "Management", Biztantra, 2008.								
4. J	AF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6 thEdition, Pearson Education, 2004.								
5. T	ripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999								
6. I	Iarold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill, 1998.								

1703MG005	TOTAL QUALITY MANAGEMENT	L	Т	Р	С
		3	0	0	3
Course Object					
1.					
2.	To study the TQM principles and its strategies.				
3.	To impart knowledge on TQM tools for continuous improvement.				
Unit I	INTRODUCTION			<b>9</b> H	lours
	Quality - Dimensions of Quality - Quality Planning - Quality costs - Analysis				
	concepts of Total Quality Management - Historical Review - Quality Stateme		0		0.
•	ophy - Crosby philosophy - Continuous Process Improvement - JuranTri	logy,	PDSA	Cycle	e, 5S,
Kaizen - Obsta	cles to TQM Implementation		-		
Unit II	TQM PRINCIPLES				Iours
Principles of T	QM, Leadership - Concepts - Role of Senior Management - Quality Council	, Custo	omer s	atisfac	tion -
	ception of Quality, Customer Complaints, Service Quality, Customer				
	Motivation, Empowerment, Teams, Recognition and Reward, Performance				
Supplier Partr	ership - Partnering, sourcing, Supplier Selection, Supplier Rating, Rel	ationsl	hip D	evelop	ment,
	easures - Basic Concepts, Strategy, Performance Measure		-		
Unit III	STATISTICAL PROCESS CONTROL (SPC)				Iours
	s of quality - Statistical Fundamentals - Measures of central Tendency and Di			-	
	al Curve, Control Charts for variables X bar and R chart and attributes I		C, ai	nd u c	harts,
	nples, Process capability, Concept of six sigma - New seven Management tools	\$	-		
Unit IV	TQM TOOLS			9 H	Iours
Benchmarking	- Reasons to Benchmark - Benchmarking Process, Quality Function Deplo	oymen	t(QFD	)- Hoi	ise of
Quality, QFD	Process, and Benefits - Taguchi Quality Loss Function - Total Productive	e Mai	ntenan	ce (TI	PM) -
Concept, Impro	wement Needs, and FMEA - Stages of FMEA- Case studies				
Unit V	QUALITY SYSTEMS			<b>9</b> H	Iours
Concept, Requ	irements of ISO 9000 and Other Quality Systems - ISO 9000:2000 Qual	ity Sy	stem -	Elem	ents,
Implementation	n of Quality System, Documentation, Quality Auditing, ISO 9000:2005 and 900	01:201	5, ISO	1400	).
	Total:			45 H	lours
Further Read	ng:				
	1. Case Study: TQM Quality and Environmental Concepts in real Work	d Appl	icatior	is	



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	2.	Environment Management system
Course Out		
		ompletion of the course, Student will be able to
	1.	Understand the concepts, dimension quality and philosophies of TQM.
	2.	Understand the principles of TQM and its strategies.
	3.	Apply seven statistical quality and management tools
	4.	Understand TQM tools for continuous improvement.
	5.	Understand the QMS and EMS
<b>References:</b>		
1.	Rathakrish	nan, Gas Dynamics, 5th edition, PHI Learing Private Limited, 2013.
2.	1	nd B. Valarmathi, Total Quality Management, Tata McGraw-Hill Publishing Company Pvt. Delhi,2009.
3.	S. Kumar, 7	Total Quality Management, Laxmi Publications Ltd. New Delhi,2006
4.	P.N. Muher	rjee, Total Quality Management, Prentice Hall of India, New Delhi,2006.
5.	DaleH.Best	terfiled, Total Quality Management, Pearson Education Inc., New Delhi, 2003.
6.	James R. E	vans and William M. Lidsay, The Management and Control of Quality, South- Western2002.

1703EC031	SATELLITE CO	MMUNICATION		Т	Р	С						
1705EC051	SATELLITE CO	WIVIUNICATION	3 0		0	3						
Course Obje	tives:											
	1. To impart knowledge about the Satellite communication.											
	2. To enhance the students" knowledge in astronomy and space											
Unit I	SATELLITE ORBITS				9 H	ours						
Introduction	Spectrum allocations for satellite	systems -Kepler, s Laws - orbital	param	eters	- orl	bital						
perturbations	station keeping - Type of orbits -	Geo stationary orbits - look angle d	etermir	nation	- limi	ts of						
visibility – e	lipse -sub satellite point – sun tra	nsit outage - launching procedures	- launc	h ve	hicles	and						
propulsion.												
Unit II	SPACE AND EARTH SEGMENT				9 H	ours						
Spacecraft tee	hnology- structure- power supply- at	titude and orbit control - thermal cor	trol ar	d pro	pulsi	on -						
		nd command - TranspondersAntenna										
reliability. Ea	th station technology -Receive only	home TV systems - MATV - CAT	$V - T_1$	ansm	it Re	ceive						
Earth Stations												
Unit III	SATELLITE ACCESS				9 H	ours						
Modulation a	d Multiplexing-Voice, Data, Video, A	Analog – digital transmission system-D	igital v	video	broad	cast						
		ent methods -spread spectrum commu										
– encryption.	Mobile satellite Service: GSM, GPS,co	ommunication between satellites										
Unit IV	SATELLITE LINK DESIGN				9 H	ours						
Introduction-	Equivalent isotropic radiated power	-Transmission Losses – Link pow	er bud	get e	quatio	on -						
System Noise	Carrier to Noise ratio - uplink - dow	nlink – effects of rain – combined upli	nk and	dow	nlink	C/N						
ratio –inter m	dulation noise - Interference between	satellite circuits.										
Unit V	SATELLITE APPLICATIONS				12 H	ours						



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Satellite mobile services – VSAT- Radarsat- GPS- Orbcomm-iridium- Direct Broadcast satellites (DBS) - Direct to home Broadcast (DTH) -Digital audio broadcast (DAB) – World space services, Business TV (BTV) – GRAMSAT - Specialized services: E mail, Video conferencing, Internet- INTELSAT Series- INSAT – INMARSAT. Remote sensing

							Total:	4	5 Hours
<b>Further Rea</b>									
			communication,			satelli	tes and	its app	lication,
	Communica	tion between	satellites, Compar	rison of sa	atellite				
<u> </u>									
Course Outc			~						
	•		ourse, Student wil						
			nechanics and laur		dologies.				
	2. Des	cribe various	s space subsystems						
	3. Exp	lain differen	t subsystems of ear	rth segme	nt				
	4. Des	ign and anal	yze link power buc	lget for sa	atellites				
	5. Des	cribe in varie	ous Satellite Appli	cations					
<b>References:</b>									
1. Wilb	ur L.Pritcha	rd, Hendri	G. Suyderhoud	, Robert	t A. Nels	son, "	Satellite	Commu	nication
Syste	emsEngineerii	ng", Prentice	Hall/Pearson, 200	7.					
2. N.Ag	garwal, "Desig	gn of Geosyn	chronous Space C	raft", Prei	ntice Hall, 1	986.			
3. Bruc	e R. Elbert	, "The Sat	ellite Communic	ation Ap	oplications"	, Han	d Book,	Artech	House
Bosta	anLondon, 19	97.							
4. Tri T	'. Ha, "Digital	Satellite Co	mmunication", II r	nd edition	, 1990.				
5. Emai	nuel Fthenakis	s, "Manual o	f Satellite Commu	nications'	', Mc Graw	Hill Bo	ook Co., 1	984.	
6. Robe	ert G. Winch,	"Telecommu	nication Trans Mis	ssion Syst	tems", Mc C	Graw-H	ill Book (	Co., 1983	3
7. Bria	n Ackroyd, "V	World Satelli	te Communication	n and ear	th station I	Design"	, BSP pr	ofessiona	lBooks,
1990						-			
8. G.B.	Bleazard, "Int	roducing Sat	ellite communicat	ions", NC	C Publicati	on, 198	5.		
9. M.R	chharia, "Sate	ellite Commu	nication Systems-	Design Pi	rinciples", N	Aacmill	an 2003.		

1901MCX02		INDIAN CONSTITUTION AND SOCIETY	L	Т	Р	С
			1	0	0	0
Course Objectiv	ves:					
	1. Tol	know about Indian constitution.				
	2. To	know about central and state government functionalities in India.				
	3. To know about Indian society					
Unit I	INTRODU	CTION			6	Hours
Historical Back	kground - (	Constituent Assembly of India - Philosophical foundations of t	he Ind	lian (	Consti	tution -
		Rights - Directive Principles of State Policy - Fundamental I	Duties	5 -	Citize	nship -
Constitutional F	Constitutional Remedies for citizens.					
Unit II	STRUCTU	RE AND FUNCTION OF CENTRAL GOVERNMENT			6	Hours
Union Government - Structures of the Union Government and Functions - President- Vice President- Prime Minister -						
Cabinet - Parliament - Supreme Court of India - Judiciary view.						



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Unit III	STRUCTURE AND FUNCTION OF STATE GOVERNMENT	6 Hours
State Governm	ent-Structure and Functions - Governor - Chief minister-Cabinet-State Legislature- Ju	dicial System in
States -High Co	ourts and other sub ordinate Courts.	
Unit IV	CONSTITUTION FUNCTIONS	6 Hours
Indian Federal	System -Center -State Relations- Constitutional Amendments - Constitutional Function	naries - Assessment of
working of Par	liamentary System in India.	
Unit V	INDIAN SOCIETY	6 Hours
Society: Nat	ure, Meaning and definition; India Political Structure; Caste, Religion, Languages i	n India;Constitutional
Remedies for	r citizens-Parties and Pressure Groups; Right of Women, Children and Scheduled	Castes and Scheduled
Tribes and oth	her Weaker Sections	
	Total:	30 Hours
<b>Further Read</b>	ing:	
	Indian penal codes.	
Course Outco		
	After completion of the course, Student will be able to	
	1. Understand the functions of Indian government	
	2. Understand and abide rules of the Indian constitution.	
	3. Understand and appreciate diversity of Indian Culture	
<b>References:</b>		
1. Durga	Das Baslli 'Introduction to the Constitution of India " Prentice Hall of India, New Delh	ni.
2. R.C.A	garwal, (1997) 'Indian Political System', S.Chand and Company, New Delhi.	
	er and Page, • Society: An Introduction Analysis "Mac Milan India Ltd., New Delhi.	
4. K.L.Sł	narma, (1997) 'Social Stratification in India: Issues and Themes', Jawaharlal NehruUniv	ersity. New Delhi.

B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) Regulations 2017 Approved in II Academic Council Meeting held on 05-05-2018

#### 1701MGX01

#### **PROFESSIONAL ETHICS**

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#### PREREQUISITE:

1. Basic understanding of business management

2. Basic understanding of human values

**COURSE OBJECTIVES:** 

- 1. To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues
  - 2. To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, Exposure to Safety and Risk, Risk Benefit Analysis
  - 3. To have an idea about the Collegiality and Loyalty, Collective Bargaining, Confidentiality,
  - Occupational Crime, Professional, Employee, Intellectual Property Rights
  - 4. TohaveanadequateknowledgeaboutMNC"s,Business,Environmental,ComputerEthics,
  - Honesty, Moral Leadership, sample Code of Conduct.
  - To use the engineering principles to update and maintain the technical skills. 5.

#### **Course Outcomes:**

After completion of the course, Student will be able to

CO1 - Discuss about Engineering ethics by using various theorems(K2)

- CO2 Describe the role of engineering as social experimentation(K2)
- CO3 Explain the role of engineers for safety(K2)
- CO4 -Discuss various responsibility and rights in professional ethics(K2)
- CO5 Discuss about various global issues and its impact in society(K2)

## ENGINEERING ETHICS

Senses of "Engineering Ethics"- Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg"s theory - Gilligan"s theory - Consensus and Controversy - Professions and Professionalism - Professional Ideals and Virtues - Uses of Ethical Theories.

# ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation - Engineers as responsible Experimenters - Research Ethics - Codes of Ethics - Industrial Standards - A Balanced Outlook on Law - The Challenger Case Study.

# UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis - Reducing Risk - The Government Regulator's Approach to Risk - Case Studies on Chernobyl, Bhopal MIC and Sterlite copper.

#### **RESPONSIBILITIES AND RIGHTS** UNIT IV

Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) -Discrimination.

#### **GLOBAL ISSUES** UNIT V

Multinational Corporations - Business Ethics - Environmental Ethics - Computer Ethics - Role in Technological Development - Weapons Development - Engineers as Managers - Consulting Engineers -Engineers as Expert Witnesses and Advisors - Honesty - Moral Leadership - Sample Code of Conduct. **TOTAL: 45 HOURS** 

# FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR:

Case study on Hiroshima and Nagasaki

#### **REFERENCES:**

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.

2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003

3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.

4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics - An Indian Perspective", Biztantra, New Delhi 2004

5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003) 6. Nptel link: https://nptel.ac.in/courses/109/106/109106117/

9 Hours

## 9 Hours

#### 9 Hours

## 9 Hours

## 9 Hours

Page | 2

B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) | Regulations 2019 Approved in IV Academic Council Meeting Held on 25.05.2019

## 1901MGX01

## TOTAL QUALITY MANAGEMENT

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#### **COURSE OBJECTIVE**

To get idea about the principles of TQM

To understand the TQM tools and techniques.

## **COURSE OUTCOME**

- CO1 Understand the outline of Total quality management
- CO2 Summarize the principles of Total quality management
- CO3 Describe the tools and techniques of Total quality management by using six sigma concepts
- Describe the tools and techniques of Total quality management by using quality function CO4 development
- CO5 Discuss the quality systems of Total quality management

#### INTRODUCTION UNIT I

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, and Customer retention - Costs of quality. 9 Hours

#### TOM PRINCIPLES UNIT II

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal -Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

#### TQM TOOLS AND TECHNIQUES I **UNIT III**

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types. 9 Hours

TQM TOOLS AND TECHNIQUES II **UNIT IV** Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) -Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

#### UNIT V **OUALITY SYSTEMS**

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors. Total: 45 Hours

## Reference(s)

1. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint 2006.

2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.

3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006. 4. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

## 9 Hours

9 Hours

## 9 Hours

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## 1901MGX02

## **Project Management and Finance**

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#### **COURSE OBJECTIVE**

To understand the project management

To know about the project evaluation

#### **COURSE OUTCOME**

CO1 Understand about the project management and selection

- CO2 Describe the implementation of project
- Discuss about evaluation and auditing of project management CO3

CO4 Summarize about the working capital management and budgeting

Discuss the finance and accounting of project management CO5

PROJECTMANAGEMENT, PROJECTSELECTIONANDPROJECT 9 Hours **UNIT I** Objectives of project management: Types of Projects: Project Management Life Cycle: Project Selection: Feasibility study: Estimation of Project Cost, Cost of Capital, Network analysis Techniques: PERT, CPM, Government regulations and statutory for various projects: 9 Hours

PROJECTIMPLIMENTATION, MONITORINGAND CONTROL UNIT II Project representation: Role of project Managers, relevance with objective of organization, preliminary manipulations ,Basic Scheduling concepts :Resource leveling ,Resource allocation, Setting a baseline, Project management information system: Importance of contracts in projects: Team work in Project Management: Formation of Effective terms.

#### PROJECTEVALUATION, AUDITINGAND OTHER RELATED 9 Hours UNIT III TOPICS IN PROJECT MANAGEMENT

Project Evaluation: Project auditing: Phase of project audit Project closure reports, computers, e-markets in Project Management:

WORKINGCAPITALMANAGEMENTANDCAPITALBUDGETING 9 Hours UNIT IV Current assets management: Estimation of working capital requirements: Capital budgeting: Capital budgeting methods: Present value method: Accounting rate of return methods. 9 Hours

#### FINANCEANDACCOUNTING UNIT V

Source of finance: Term Loans: Capital Structure: Financial Institution Accounting Principles: Preparation and Interpretation of balance sheets, profit and loss statements, Fixed Assets, Current assets, Depreciation methods :Break even analysis:

#### Total: 45 Hours

#### Reference(s)

- 1. Project Management Institute "A Guide to the Project Management Body of Knowledge" PMBOK® Guide (Sixth Edition), Sept2017
- James C.Van Horne, "Fundamentals of Financial Management", Person Education2004. 2.
- 3. KüsterJ., Huber, E., Lippmann, R., Schmid, A., Schneider, E., Witschi, U., Wüst, R." Project Management Handbook",2015
- Khanna, R.B., "Project Management", PHI 2011.
- Prasanna Chandra, "Financial Management", TataMcGraw-Hill,2008. 5.
- By Carl S. Warren, James M. Reeve, Jonathan Duchac."Financial & Managerial 6. Accounting",2016
- 7. Paneer Selvam, R., and Senthilkumar, P., "Project Management", PHI, 2011.

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#### 1901MGX04

## PRINCIPLES OF MANAGEMENT

#### **COURSE OBJECTIVES:**

- To develop cognizance about importance of management principles.
- Extract the functions and responsibilities of managers.
- To Study and understand the various HR related activities.
- Learn the application of the theories in an organization.
- Analyze the position of self and company goals towards business.

## **COURSE OUTCOME**

- CO1 Understand about the outline of management and its organization
- CO2 Discuss the planning involved in management
- CO3 Describe the nature of organizing structure in management
- CO4 Understand the concept of directing in management
- CO5 Discuss the concept of controlling in management

## UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

Definition of Management Science or Art Manager Vs Entrepreneur-types of managers- Managerial roles and skills Evolution of Management Scientific, Human Relations, System and Contingency approaches Types of Business organization- Sole proprietorship, partnership, Company-public and private sector enterprises-Organization culture and Environment Current Trends and issues in Management.

#### UNIT II PLANNING

Nature and purpose of planning-Planning process-Types of planning-Objectives-Setting objectives- Policies-Planning premises - Strategic Management- Planning Tools and Techniques-Decision making steps and process.

## UNIT III ORGANISING

Nature and purpose Formal and informal organization - Organization chart - Organization Structure Types Line and staff authority – Departmentalization - delegation of authority - Centralization and decentralization -Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development Performance Management - Career planning and management.

#### UNIT IV DIRECTING

Foundations of individual and group behaviour-Motivation-Motivation theories - Motivational techniques-Job satisfaction - Job enrichment-Leadership-types and theories of leadership - Communication-Process of communication-Barrier in communication Effective communication -Communication and IT.

#### UNIT V CONTROLLING

System and process of controlling-Budgetary and non-Budgetary control techniques-Use of Computers and IT in Management control-Productivity problems and management-Control and Performance-Direct and preventive control-Reporting.

#### **REFERENCES:**

- 1. Robbins, S. (2017). Management, (13th ed.), Pearson Education, New Delhi.
- 2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, Fundamentals of Management, Pearson Education, 7th Edition, 2011.
- 3. Robert Kreitner and Mamata Mohapatra, Management, Biztantra, 2008.
- 4. L. M. Prasad, Principles and Practice of Management. 7th Edition, Sultan Chand & Sons, 2007.
- 5. P. C. Tripathi and P. N. Reddy, Principles of Management, Fourth Edition, Tata McGraw Hill, 2008

## B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) Regulations 2017 Approved in II Academic Council Meeting held on 05-05-2018

## TOTAL QUALITY MANAGEMENT

#### Р C $\mathbf{L}$ T 3 0 3

## **COURSE OBJECTIVES:**

1703MG002

- 1. To learn concepts, dimension quality and philosophies of TQM.
- 2. To study the TQM principles and its strategies.
- 3. To impart knowledge on TQM tools for continuous improvement.

## **COURSE OUTCOMES:**

- After completion of the course, Student will be able to
- Understand the concepts, dimension quality and philosophies of TQM. CO1:
- Understand the principles of TQM and its strategies. CO2:
- CO3: Apply seven statistical quality and management tools
- Understand TQM tools for continuous improvement. CO4:
- Understand the QMS and EMS CO5:

#### INTRODUCTION **UNIT I**

Definition of Quality - Dimensions of Quality - Quality Planning - Quality costs - Analysis Techniques for Quality Costs - Basic concepts of Total Quality Management - Historical Review - Quality Statements - Strategic Planning, Deming Philosophy - Crosby philosophy - Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen -Obstacles to TQM Implementation 9 Hours

#### TQM PRINCIPLES UNIT II

Principles of TQM, Leadership - Concepts - Role of Senior Management - Quality Council, Customer satisfaction -Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement -Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits - Supplier Partnership -Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure 9 Hours

STATISTICAL PROCESS CONTROL (SPC) UNIT III

The seven tools of quality - Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables X bar and R chart and attributes P, NP, C, and u charts, Industrial Examples, Process capability, Concept of six sigma - New seven Management tools Hours 9

#### **UNIT IV TOM TOOLS**

Benchmarking - Reasons to Benchmark - Benchmarking Process, Quality Function Deployment (QFD)- House of Quality, QFD Process, and Benefits - Taguchi Quality Loss Function - Total Productive Maintenance (TPM) - Concept, Improvement Needs, and FMEA - Stages of FMEA- Case studies 9 Hours

#### QUALITY SYSTEMS UNIT V

Concept, Requirements of ISO 9000 and Other Quality Systems - ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 9000:2005 and 9001:2015, ISO 14000.

## FURTHER READING:

- 1. Case Study: TQM Quality and Environmental Concepts in real World Applications
- 2. Environment Management system

## **REFERENCES:**

- 1. Rathakrishnan, Gas Dynamics, 5th edition, PHI Learing Private Limited, 2013.
- 2. N. Gupta and B. Valarmathi, Total Quality Management, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2009.
- 3. S. Kumar, Total Quality Management, Laxmi Publications Ltd. New Delhi, 2006
- 4. P.N. Muherjee, Total Quality Management, Prentice Hall of India, New Delhi, 2006.
- 5. DaleH.Bester filed, Total Quality Management, Pearson Education Inc., New Delhi, 2003.
- 6. James R. Evans and William M. Lidsay, The Management and Control of Quality, South- Western 2002.

TOTAL:

## **45 HOURS**

9 Hours

#### 1703EE002

#### **ELECTRICAL SAFETY AND MANAGEMENT**

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#### **PREREQUISITE :**

Transmission & Distribution

#### **COURSE OBJECTIVES:**

- 1. To Understand the concepts of Indian rules and earthing.
- 2. To get knowledge in first aid and fire extinguishers operating procedures.
- 3. To understand the safety policy in management & organizations.

#### **COURSE OUTCOMES:**

- After completion of the course, Student will be able to
- Understand the Indian electricity rules and their significance.(K2) CO1
- CO<sub>2</sub> Identify hazardous areas in Industrial sectors.(K2)
- CO3 Describe the various steps in first aid and safety during electrical installation.(K2)
- CO4 Investigate the various fire extinguishers and its mode of operation.(K3)
- CO<sub>5</sub> Make use of energy management and energy auditing procedures in industrial sectors. (K3).

#### UNIT I **RULES & REGULATIONS**

Power sector organization and their roles; significance of IE rules & IE acts; general safety requirements: span, conductor configuration, spacing and clearing, sag, erection, hazards of electricity.

INSTALLATION AND EARTHING OF EQUIPMENTS UNIT II

Classification of electrical installation; earthing of equipment bodies; electrical layout of switching devices and SC protection; safety in use of domestic appliances; safety documentation and work permit system; flash hazard calculations; tools and test equipments.

UNIT III SAFETY MANAGEMENT AND FIRST AID

Safety aspects during commissioning safety clearance notice before energizing, safety during maintenance, maintenance schedule; special tools; security grand; check list for plant security; effects of electric and electromagnetic fields in HV lines and substations; safety policy in management & organizations; first aid; basic principles; action taken after electrical shock; artificial respiration and methods.

#### UNIT IV FIRE EXTINGUISHERS

Fundamentals of fire- initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system ;CO<sub>2</sub> and Halogen gas schemes; foam schemes.

#### **ENERGY MANAGEMENT & ENERGY AUDITING UNIT V**

Objectives of energy management; energy efficient electrical systems; energy conservation and energy policy; renewable source of energy; energy auditing; types and tips for improvement in industry.

#### FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Brief about role of Bureau of Energy Efficiency (BEE) in energy conservation.

2. Implementation of engineering ethics in safety management.

## **REFERENCES:**

1. Rao.S, Khanna.R.C, "Electrical safety, Fire safety engineering and safety management", Hanna publisher, Delhi, 2<sup>nd</sup> edition, 1998.

2. Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth company, 1978.

2. Power Engineering Hand book, TNEB Engineers officers, Chennai, 2002.

3. John Codick, "Electrical safety hand book", McGraw Hill Inc., New Delhi, 2000.

4. The Indian electricity rules, 1956, authority regulations, 1979, Commercial Law Publication, Delhi, 1999.

5. V. Manoilov, "Fundamentals of electrical safety", Mir Publishers, MOSCOW, 1975

9 Hours

9 Hours

9 Hours

## 9 Hours

#### 9 Hours

**45 HOURS** 

TOTAL:

B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) Regulations 2017 Approved in II Academic Council Meeting held on 05-05-2018

PROFESSIONAL ETHICS

## 1701MGX01

PREREQUISITE:

- 1. Basic understanding of business management
- Basic understanding of human values 2

COURSE OBJECTIVES:

- 1. To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral
  - 2. To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, Exposure to Safety and Risk, Risk Benefit Analysis
  - To have an idea about the Collegiality and Loyalty, Collective Bargaining, Confidentiality, 3.
  - Occupational Crime, Professional, Employee, Intellectual Property Rights To have an adequate knowledge about MNC"s, Business, Environmental, Computer Ethics, State and State and
  - Honesty, Moral Leadership, sample Code of Conduct. 5. To use the engineering principles to update and maintain the technical skills.

Course Outcomes:

After completion of the course, Student will be able to

CO1 - Discuss about Engineering ethics by using various theorems(K2) CO2 - Describe the role of engineering as social experimentation(K2)

- CO3 Explain the role of engineers for safety(K2)
- CO4 -Discuss various responsibility and rights in professional ethics(K2)
- CO5 Discuss about various global issues and its impact in society(K2)

Senses of "Engineering Ethics"- Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy – Kohlberg"s theory – Gilligan"s theory – Consensus and Controversy – Professions and Professionalism - Professional Ideals and Virtues - Uses of Ethical Theories. 9 Hours

Engineering as Experimentation - Engineers as responsible Experimenters - Research Ethics - Codes of Ethics ENGINEERING AS SOCIAL EXPERIMENTATION - Industrial Standards - A Balanced Outlook on Law - The Challenger Case Study. 9 Hours

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis - Reducing Risk - The Government ENGINEER'S RESPONSIBILITY FOR SAFETY Regulator's Approach to Risk - Case Studies on Chernobyl, Bhopal MIC and Sterlite copper. 9 Hours

Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) -Discrimination. 9 Hours

Multinational Corporations - Business Ethics - Environmental Ethics - Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – UNIT V Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct. TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR: Case study on Hiroshima and Nagasaki

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999. 2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003

3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford 4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi

5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003) 2004 6. Nptel link: https://nptel.ac.in/courses/109/106/109106117/

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#### SWITCHED RELUCTANCE MOTORS (SRM) UNIT III

Constructional features - Rotary and Linear SRM - Principle of operation - Torque production -Steady state performance prediction- Analytical method -Power Converters and their controllers -Methods of Rotor position sensing - Sensor less operation - Characteristics and Closed loop control - Applications.

#### PERMANENT MAGNET BRUSHLESS D.C. MOTORS UNIT IV

Permanent Magnet materials - Minor hysteresis loop and recoil line-Magnetic Characteristics -Permeance coefficient -Principle of operation - Types - Magnetic circuit analysis - EMF and torque equations - Commutation - Power Converter Circuits and their controllers - Motor characteristics and control- Applications.

#### PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM) UNIT V

Principle of operation - Ideal PMSM - EMF and Torque equations - Armature MMF - Synchronous Reactance - Sine wave motor with practical windings - Phasor diagram - Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements- Applications.

## **TOTAL: 45 PERIODS**

## **OUTCOMES:**

Ability to model and analyze electrical apparatus and their application to power system

#### TEXT BOOKS:

- 1. K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
- 2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
- 3. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

## **REFERENCES:**

- 1. R.Krishnan, 'Switched Reluctance Motor Drives Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
- 2. P.P. Aearnley, 'Stepping Motors A Guide to Motor Theory and Practice', Peter Perengrinus London, 1982.
- 3. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
- 4. E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

## MG6851

## PRINCIPLES OF MANAGEMENT

## LT P C 3003

#### **OBJECTIVES:**

 To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

#### INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS UNITI

Definition of Management - Science or Art - Manager Vs Entrepreneur - types of managers managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment - Current trends and issues in Management.

#### PLANNING UNIT II

Nature and purpose of planning - planning process - types of planning - objectives - setting objectives - policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process.

#### ORGANISING UNIT III

Nature and purpose - Formal and informal organization - organization chart - organization structure - types - Line and staff authority - departmentalization - delegation of authority - centralization and decentralization - Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

#### DIRECTING UNIT IV

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication - process of communication - barrier in communication - effective communication communication and IT.

#### CONTROLLING UNIT V

System and process of controlling - budgetary and non-budgetary control techniques - use of computers and IT in Management control - Productivity problems and management - control and performance - direct and preventive control - reporting.

TOTAL: 45 PERIODS

#### OUTCOMES:

 Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

## TEXT BOOKS:

- Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltc., 10th Edition, 1. 2009.
- JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2. 2004.

#### **REFERENCES:**

- Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 1. Pearson Education, 7th Edition, 2011.
- Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008. 2.
- Harold Koontz & Heinz Weihrich "Essentials of Management" Teta McGraw Hill, 1998. 3.
- Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999.
- 4.

Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

## **TOTAL: 45 PERIODS**

## OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society •
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster • damage assessment and management.

## **TEXTBOOKS:**

- 1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
- 2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
- 3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
- 4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

## REFERENCES

- 1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
- 2. Government of India, National Disaster Management Policy,2009.

## PROFESSIONAL ETHICS IN ENGINEERING

#### **OBJECTIVES:**

**GE6075** 

 To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

#### HUMAN VALUES UNIT I

Morals, values and Ethics - Integrity - Work ethic - Service learning - Civic virtue - Respect for others - Living peacefully - Caring - Sharing - Honesty - Courage - Valuing time - Cooperation -Commitment - Empathy - Self confidence - Character - Spirituality - Introduction to Yoga and meditation for professional excellence and stress management.

#### ENGINEERING ETHICS UNIT II

Senses of 'Engineering Ethics' - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models of professional roles - Theories about right action - Self-interest - Customs and Religion - Uses of Ethical Theories.

#### ENGINEERING AS SOCIAL EXPERIMENTATION UNIT III

Engineering as Experimentation - Engineers as responsible Experimenters - Codes of Ethics -A Balanced Outlook on Law.

#### SAFETY, RESPONSIBILITIES AND RIGHTS UNIT IV

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis and Reducing Risk -

LT P C 3003

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Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) - Discrimination.

8

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development -Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors -Moral Leadership -Code of Conduct - Corporate Social Responsibility. TOTAL: 45 PERIODS

#### OUTCOMES:

 Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

- 1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
- 2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

- 1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
- 2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics Concepts and Cases", Cengage Learning, 2009.
- 3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
- 4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers",
- Oxford University Press, Oxford, 2001. 5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
- 6. World Community Service Centre, ' Value Education', Vethathiri publications, Erode, 2011.

#### Web sources:

- www.onlineethics.org 1.
- www.nspe.org 2.
- www.globalethics.org 3.
- www.ethics.org 4.

# TOTAL QUALITY MANAGEMENT

# GE6757

## LTPC 3003

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## OBJECTIVES:

To facilitate the understanding of Quality Management principles and process.

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

#### UNIT V GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

#### OUTCOMES:

TOTAL: 45 PERIODS

Upon completion of the course, the student should be able to apply ethics in society, discuss the
ethical issues related to engineering and realize the responsibilities and rights in the society.

#### TEXT BOOKS:

- 1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
- 2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

#### REFERENCES:

- 1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
- 2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics Concepts and Cases", Cengage Learning, 2009.
- 3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
- 4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
- 5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
- 6. World Community Service Centre, 'Value Education', Vethathiri publications, Erode, 2011.

#### Web sources:

- 1. www.onlineethics.org
- 2. www.nspe.org
- 3. www.globalethics.org
- 4. www.ethics.org

#### TOTAL QUALITY MANAGEMENT

## L T P C 3 0 0 3

#### **OBJECTIVES:**

GE6757

To facilitate the understanding of Quality Management principles and process.

#### UNIT I INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

#### UNIT II TQM PRINCIPLES

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal

Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

#### TQM TOOLS AND TECHNIQUES I UNIT III

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

#### TQM TOOLS AND TECHNIQUES II UNIT IV

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) -Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

#### QUALITY SYSTEMS UNIT V

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing -QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation inmanufacturing and service sectors.

## **TOTAL: 45 PERIODS**

#### OUTCOMES:

The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

#### TEXT BOOK:

1. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint, 2006.

#### **REFERENCES:**

- 1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
- 2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
- 3. Janakiraman. B and Gopal .R.K., "Total Quality Management Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

#### EC6002

## ADVANCED DIGITAL SIGNAL PROCESSING

## LTPC 3 0 0 3

#### **OBJECTIVES:**

- To bring out the concepts related to stationary and non-stationary random signals
- To emphasize the importance of true estimation of power spectral density
- To introduce the design of linear and adaptive systems for filtering and linear prediction
- To introduce the concept of wavelet transforms in the context of image processing

#### DISCRETE-TIME RANDOM SIGNALS UNIT I

Discrete random process - Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

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B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) Regulations 2017 Approved in II Academic Council Meeting held on 05-05-2018

# TOTAL QUALITY MANAGEMENT

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# 1703MG002

# COURSE OBJECTIVES:

- 1. To learn concepts, dimension quality and philosophies of TQM.
- To study the TQM principles and its strategies.
- 3. To impart knowledge on TQM tools for continuous improvement.

# COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Understand the concepts, dimension quality and philosophies of TQM.
- CO2: Understand the principles of TQM and its strategies.
- CO3: Apply seven statistical quality and management tools
- CO4: Understand TQM tools for continuous improvement.
- CO5: Understand the QMS and EMS

Definition of Quality - Dimensions of Quality - Quality Planning - Quality costs - Analysis Techniques for Quality Costs - Basic concepts of Total Quality Management - Historical Review - Quality Statements - Strategic Planning, Deming Philosophy - Crosby philosophy - Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen -9 Hours

Obstacles to TQM Implementation

Principles of TQM, Leadership - Concepts - Role of Senior Management - Quality Council, Customer satisfaction -Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement -Motivation, Empowerment Teams, Recognition and Reward, Performance Appraisal, Benefits - Supplier Partnership -Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic 9 Hours

Concepts, Strategy, Performance Measure

The seven tools of quality - Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables X bar and R chart and attributes P, NP, C, and u charts, Industrial Examples, Process capability, Concept of six sigma - New seven Management tools

TQM TOOLS

Benchmarking - Reasons to Benchmark - Benchmarking Process, Quality Function Deployment Quality, QFD Process, and Benefits - Taguchi Quality Loss Function - Total Productive Maintenance (TPM) - Concept, Improvement Needs, and FMEA - Stages of FMEA- Case studies 9 Hours

Concept, Requirements of ISO 9000 and Other Quality Systems - ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 9000:2005 and 9001:2015, ISO 14000. 45 HOURS TOTAL:

# FURTHER READING:

1. Case Study: TQM Quality and Environmental Concepts in real World Applications

2. Environment Management system

## **REFERENCES:**

- 1. Rathakrishnan, Gas Dynamics, 5th edition, PHI Learing Private Limited, 2013.
- 2. N. Gupta and B. Valarmathi, Total Quality Management, Tata McGraw-Hill Publishing Company Pvt. Ltd., New 3. S. Kumar, Total Quality Management, Laxmi Publications Ltd. New Delhi, 2006
- 4. P.N. Muherjee, Total Quality Management, Prentice Hall of India, New Delhi, 2006. 5. DaleH.Bester filed, Total Quality Management, Pearson Education Inc., New Delhi, 2003.
- 6. James R. Evans and William M. Lidsay, The Management and Control of Quality, South- Western 2002.

# 9 Hours

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#### 1703EE002

# ELECTRICAL SAFETY AND MANAGEMENT

**PREREQUISITE** :

## Transmission & Distribution

## COURSE OBJECTIVES:

1. To Understand the concepts of Indian rules and earthing.

- 2. To get knowledge in first aid and fire extinguishers operating procedures.
- 3. To understand the safety policy in management & organizations.

## **COURSE OUTCOMES:**

After completion of the course, Student will be able to

- Understand the Indian electricity rules and their significance.(K2) CO1
- Identify hazardous areas in Industrial sectors.(K2) CO2
- Describe the various steps in first aid and safety during electrical installation.(K2) CO3
- Investigate the various fire extinguishers and its mode of operation.(K3) CO4
- Make use of energy management and energy auditing procedures in industrial sectors. (K3) CO<sub>5</sub> 9 Hours

## **RULES & REGULATIONS**

Power sector organization and their roles; significance of IE rules & IE acts; general safety requirements: span, conductor configuration, spacing and clearing, sag, erection, hazards of electricity. 9 Hours

INSTALLATION AND EARTHING OF EQUIPMENTS Classification of electrical installation; earthing of equipment bodies; electrical layout of switching devices and SC protection; safety in use of domestic appliances; safety documentation and work permit system; flash hazard calculations; tools and test equipments.

SAFETY MANAGEMENT AND FIRST AID **UNIT III** 

Safety aspects during commissioning safety clearance notice before energizing, safety during maintenance, maintenance schedule; special tools; security grand; check list for plant security; effects of electric and electromagnetic fields in HV lines and substations; safety policy in management & organizations; first aid; basic principles; action taken after electrical shock; artificial respiration and methods.

#### FIRE EXTINGUISHERS UNIT IV

Fundamentals of fire- initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system ;CO2 and Halogen gas schemes; foam schemes. 9 Hours

# ENERGY MANAGEMENT & ENERGY AUDITING

Objectives of energy management; energy efficient electrical systems; energy conservation and energy policy; renewable source of energy; energy auditing; types and tips for improvement in industry. **45 HOURS** TOTAL:

# FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Brief about role of Bureau of Energy Efficiency (BEE) in energy conservation.

2. Implementation of engineering ethics in safety management.

1. Rao.S, Khanna.R.C, "Electrical safety, Fire safety engineering and safety management", Hanna publisher, Delhi, 2<sup>nd</sup> edition, 1998.

2. Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth company, 1978.

2. Power Engineering Hand book, TNEB Engineers officers, Chennai, 2002.

3. John Codick, "Electrical safety hand book", McGraw Hill Inc., New Delhi, 2000.

4. The Indian electricity rules, 1956, authority regulations, 1979, Commercial Law Publication, Delhi, 1999.

5. V. Manoilov, "Fundamentals of electrical safety", Mir Publishers, MOSCOW, 1975

#### 9 Hours

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#### 1901MCX02

## **CONSTITUTION OF INDIA**

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## **COURSE OBJECTIVES:**

- 1. To understand about Indian constitution and its structure
- 2. To obtain the knowledge in constitution function and Indian society

## **COURSE OUTCOMES:**

- On the successful completion of the course, students will be able to
- CO1 Understand the background and foundations of Indian Constitution
- CO2 Describe the structure and function of central government CO3 Discuss the
- CO3 Discuss the structure and function of state government
- CO4 Explain the constitution functions and parliamentary system in India
- Understand about the Indian society

## MODULE I INTRODUCTION

6 Hours Preamble Fundamental Rights Directive Principles of State Policy -Fundamental Duties -Citizenship -MODULE II STRUCTURE AND FUNCTION of an and

- MODULE IISTRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT6 HoursUnion Government Structures of the Union Government and Functions President- Vice President- Prime6 HoursMinister Cabinet Parliament Supreme Court of India Judiciary view9
- MODULE III
   STRUCTURE AND FUNCTION OF STATE GOVERNMENT
   6 Hours

   State Government-Structure and Functions Governor Chief minister-Cabinet-State Legislature- Judicial
   6 Hours

   System in States -High Courts and other sub ordinate Courts.
   6 Hours

# MODULE IV CONSTITUTION FUNCTIONS

Indian Federal System -Center -State Relations- Constitutional Amendments - Constitutional Functionaries – Assessment of working of Parliamentary System in India

## MODULE V INDIAN SOCIETY

Society: Nature, Meaning and definition; India Political Structure; Caste, Religion, Languages in India; Constitutional Remedies for citizens-Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections

#### **REFERENCES:**

- **TOTAL: 30 HOURS**
- 1. Durga Das Baslli "Introduction to the Constitution of India" Prentice Hall of India, New Delhi.
- 2. R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
- Maciver and Page, "Society: An Introduction Analysis " Mac Milan India Ltd., New Delhi
   K I. Sharma (1007) (Societ Construction Analysis " Mac Milan India Ltd., New Delhi
- K.L. Sharma, (1997) 'Social Stratification in India: Issues and Themes', Jawaharlal Nehru University, New Delhi.

- 5. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.
- 6. S.Ghoshal, " Embedded Systems & Robotics" Projects using the 8051 Microcontroller", Cengage Learning, 2009.

#### GE6083

## DISASTER MANAGEMENT

#### **OBJECTIVES:**

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

#### UNIT I INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

## UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj

Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

## UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

## UNIT IV DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

# UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man

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Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

#### TOTAL: 45 PERIODS

## OUTCOMES:

#### The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

#### **TEXTBOOKS:**

- 1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
- 2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
- 3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
- 4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

#### REFERENCES

- 1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
- 2. Government of India, National Disaster Management Policy, 2009.

#### GE6075

## **PROFESSIONAL ETHICS IN ENGINEERING**

#### **OBJECTIVES:**

 To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

#### UNIT I HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

#### UNIT II ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

## UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

## UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk - Assessment of Safety and Risk - Risk Benefit Analysis and Reducing Risk -

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## GE6084

#### HUMAN RIGHTS

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#### **OBJECTIVES:**

To sensitize the Engineering students to various aspects of Human Rights.

#### **UNIT I**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

#### UNIT II

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

#### 

Theories and perspectives of UN Laws - UN Agencies to monitor and compliance.

#### UNIT IV

Human Rights in India - Constitutional Provisions / Guarantees.

#### UNIT V

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

**TOTAL : 45 PERIODS** 

#### OUTCOME :

Engineering students will acquire the basic knowledge of human rights.

#### **REFERENCES:**

- 1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
- 2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
- 3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

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#### 1901MCX03

## ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

#### **COURSE OBJECTIVE**

(Common to All Branches)

To understand Indian Traditional culture and philosophy

To understand the education system in India

#### **COURSE OUTCOME**

- On the successful completion of the course, students will be able to
- CO1 Describe the culture, literature and religion of India
- CO2 Discuss the development of technology and Engineering in India
- Summarize the education system in India CO3

#### **MODULE I** INTRODUCTION TO CULTURE

Culture, civilization, culture and heritage, general characteristics of culture importance of culture in human literature. Indian Culture, Ancient India, Medieval India, Modern India.

#### MODULE II INDIAN LANGUAGES, CULTURE AND LITERATURE

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature-II: Northern Indian languages & literature.

#### **MODULE III RELIGION AND PHILOSOPHY**

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only).

#### **MODULE IV** FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING)

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India.

#### **MODULE V EDUCATION SYSTEM IN INDIA**

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

#### **REFERENCES:**

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005

2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007

3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200

4. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993

5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989

6. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN 13: 978- 8120810990, 2014

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#### 6 Hours

TOTAL **30 Hours** 

#### 1703EE004

#### **BIOMEDICAL INSTRUMENTATION**

#### **PREREQUISITE :**

1. Measurement and instrumentation

2. Electron Devices and Circuits

### **COURSE OBJECTIVES:**

- 1. To introduce Fundamentals of biomedical engineering.
- 2. To study the communication mechanics in a biomedical system with few examples.
- 3. To study measurement of important electrical and non-electrical parameters.
- 4. To understand the basic principles in imaging techniques.

#### **COURSE OUTCOMES:**

- After completion of the course, Student will be able to
- CO1 Have a basic knowledge in life assisting and therapeutic devices.
- CO2 Explain the various sensing and measurement devices of electrical origin.
- CO3 Discuss about the awareness of electrical safety of medical equipment's.
- CO4 Elucidate the important and modern methods of imaging techniques.

CO5 Obligate latest knowledge of medical assistance / techniques and therapeutic.

UNIT I

## FUNDAMENTALS OF BIOMEDICAL ENGINEERING AND TRANSDUCERS

Cell and its structure – resting and action potential – nervous system functional organization of the nervous system structure of nervous system, neurons - synapse - basic components of a biomedical system- cardiovascular systemsrespiratory systems -kidney and blood flow - biomechanics of bone - biomechanics of soft tissues - basic mechanics of spinal column and limbs -transducers – selection criteria.

DIAGNOSTIC PROCEDURES AND NON ELECTRICAL PARAMETERS **09 Hours UNIT II** MEASUREMENT

Measurement of blood pressure - cardiac output - heart rate - heart sound - pulmonary function measurements spirometer - photo plethysmography, body plethysmography - blood gas analyzers, pH of blood -measurement of blood pCO2, pO2, finger-tip oximeter - ESR, GSR measurements. **09 Hours** 

#### ELECTRO – PHYSIOLOGICAL MEASUREMENTS UNIT III

Physiological signals and transducers - Temperature measurements - Fibre optic temperature sensors. Electrodes - Limb electrodes -floating electrodes - pregelled disposable electrodes - Micro, needle and surface electrodes - Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers –Isolation amplifier – Typical waveforms - Electrical safety in medical environment, shock hazards - leakage current-Instruments for checking safety parameters of biomedical equipment.

#### IMAGING MODALITIES AND ANALYSIS UNIT IV

Radio graphic and fluoroscopic techniques - computer tomography - MRI - ultrasonography - endoscopy thermography -different types of biotelemetry systems - retinal imaging - imaging application in biometric systems analysis of digital images. ECG, EEG, EMG, ERG - lead systems and recording methods.

#### LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES UNIT V

Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy - Heart - Lung machine -Audio meters - Dialyzers - Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery - Advanced 3D surgical techniques- Orthopedic prostheses fixation.

#### FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

- 1. Nucleonic instrumentation.
- 2. Plasmon resonance immunosensors.

#### **REFERENCES:**

- John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 1. Fourth edition 2010.
- 1. Duane Knudson, "Fundamentals of Biomechanics", Springer, second Edition, 2007.
- 2. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, first Edition, 2011.
- 3. Ed. Joseph D. Bronzino, "The Biomedical Engineering Hand Book", CRC Press LLC, Third Edition 2006.
- 4. Joseph J.carr and John M. Brown, "Introduction to Biomedical Equipment Technology", John Wiley And sons, New York, fourth Edition, 2012.

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## **09 Hours**

## **09 Hours**

**45 HOURS** 

TOTAL:

## **BIOMEDICAL INSTRUMENTATION**

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## **OBJECTIVES:**

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

#### FUNDAMENTALS OF BIOMEDICAL ENGINEERING UNITI

Cell and its structure - Resting and Action Potential - Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues - Basic mechanics of spinal column and limbs -Physiological signals and transducers - Transducers - selection criteria - Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

#### NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC UNIT II PROCEDURES

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements - spirometer - Photo Plethysmography, Body Plethysmography - Blood Gas analysers, pH of blood -measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.

#### ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS UNIT III

Electrodes - Limb electrodes - floating electrodes - pregelled disposable electrodes - Micro, needle and surface electrodes - Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers - Isolation amplifier - ECG - EEG - EMG - ERG - Lead systems and recording methods - Typical waveforms - Electrical safety in medical environment, shock hazards - leakage current-Instruments for checking safety parameters of biomedical equipments.

#### IMAGING MODALITIES AND ANALYSIS UNIT IV

Radio graphic and fluoroscopic techniques - Computer tomography - MRI - Ultrasonography -Endoscopy - Thermography -Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images.

#### LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES UNIT V

Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy - Heart - Lung machine - Audio meters - Dialysers - Lithotripsy - ICCU patient monitoring system - Nano Robots -Robotic surgery – Advanced 3D surgical techniques- Orthopedic prostheses fixation.

#### **TOTAL: 45 PERIODS**

#### OUTCOMES:

 Ability to understand and analyze Instrumentation systems and their applications to various industries.

## TEXT BOOKS:

- 1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New Delhi, 2007.
- 2. Joseph J.carr and John M. Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4<sup>th</sup> Edition, 2012.

B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) Regulations 2017 Approved in II Academic Council Meeting held on 05-05-2018

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#### HIGH VOLTAGE ENGINEERING

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#### **PREREOUISITE :**

1. Power system analysis

Transmission and Distribution 2.

**COURSE OBJECTIVES:** 

1. Understand transient overvoltage and the protection of high voltage apparatus

2. Understand high voltage generation and measurement techniques in high voltage engineering

3. Specify testing methods and standards in high voltage equipment testing

## **COURSE OUTCOMES:**

After completion of the course, Student will be able to

CO 1 Describe the fundamentals of over voltages, causes of over voltages and protection against over voltages(K2) CO2 Explain the breakdown mechanism in gaseous, liquid, and vacuum dielectrics(K2)

CO3 Review the methods of generation of high voltages and high currents(K2)

CO4 Summarize the measurement techniques of high voltages and high currents (K2)

CO5 Infer the high voltage testing of electrical power apparatus like insulator, bushing, circuit breaker, isolater and transformer(K2)

9 Hours **OVERVOLTAGE PHENOMENON** UNIT I Electric field stresses; Estimation and control of electric stress; Natural causes of overvoltage; Lightning phenomenon Mathematical modeling of lightning; Overvoltage due to switching surges; Surge voltage distribution and control.

#### DIELECTRIC BREAKDOWN IN LIQUID, SOLID AND GASEOUS 9 Hours UNIT II DIELECTRICS

Breakdown mechanisms in liquid dielectric-Liquid dielectrics used in practice; Various processes of breakdown in solid dielectrics -Solid dielectrics used in practice; Ionization process; Corona discharge; Gaseous breakdown in uniform, Non uniform fields; selection of gases as insulating materials.

#### GENERATION OF HIGH VOLTAGE AND CURRENT **UNIT III**

Generation of high DC voltage; Van de graff generator; Cascaded transformer ;Standard impulse wave shapes; Marx circuit generation of switching surges; Impulse current generation; Impulse generators.

#### MEASUREMENT OF HIGH VOLTAGE AND CURRENT UNIT IV

Measurement of HVDC current and voltage; Measurement of high AC and impulse voltages; Measurement of high current: Direct, alternating and impulse current; Cathode Ray Oscilloscope measurement technique for impulse voltage and current.

#### HIGH VOLTAGE TESTING AND INSULATION COORDINATION 9 Hours UNIT V

Principles of Insulation coordination; Testing of electrical apparatus- Insulators, Bushings, Circuit breakers, Cables , Transformer ; Test standards ; Ratings of high voltage laboratories.

TOTAL: **45 HOURS** 

9 Hours

9 Hours

# FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Power system transients

2. Indian testing standards of high voltage apparatus

**REFERENCES:** 

1. S. Naidu and V. Kamaraju, "High Voltage Engineering", Tata McGraw Hill, Fifth Edition, 2013.

- 2. E. Kuffel and W.S. Zaengl, J. Kuffel, "High voltage Engineering fundamentals", Newness Second Edition Elsevier, New Delhi, 2005.
- 3. Subir Ray, "An Introduction to High Voltage Engineering", PHI Learning Private Limited, New Delhi, Second Edition, 2013.
- 4. C.L. Wadhwa, "High Voltage Engineering "New Age International, 2007.

5. Dieter Kind, Kurt Feser, "High Voltage test techniques", Newness, 2001.

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# 1703EE018

#### **PREREQUISITE :**

1. Renewable Energy Sources.

2. Power Electronics.

#### **COURSE OBJECTIVES:**

1. To design different power converters namely DC to DC and AC to AC converters for renewable energy systems.

- 2. To Provide knowledge about the stand alone and grid connected renewable energy systems.
- 3. To analyze and comprehend the various operating modes of wind electrical generators
- and solar energy systems.

#### **COURSE OUTCOMES:**

- After completion of the course, Student will be able to
- CO1 List the various renewable energy sources and its impacts like wind, ocean, biomass, fuel cell, and hydrogen and hybrid energy system
- Describe the applications of various generators & power converters like PWM CO2 Inverters, Buck Boost converter, AC voltage controller and matrix inverter in solar and WECS
- Explain the need of hybrid energy systems and its impacts with case studies CO3
- CO4 Explain the stand-alone and grid interactive issues related with solar & WECS.
- Illustrate P&O, INC and Hybrid algorithms for solar system CO5
- INTRODUCTION TO RENEWABLE ENERGY CONVERSION UNIT I

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION UNIT II 9 Hours Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG. 9 Hours

**POWER CONVERTERS** UNIT III

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversionmode) - Boost and buck-boost converters- selection of inverter, battery sizing, And array sizing Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Invertersmatrix converters.

#### **UNIT IV** ANALYSIS OF WIND AND PV SYSTEMS

Stand-alone operation of fixed and variable speed wind energy conversion systems and solar system- Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system.

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

#### FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1.Case study on MPPT

2. Case study of hybrid energy system.

#### **REFERENCES:**

1. Rashid .M. H "Power electronics Hand book", Academic press, third edition, 2009.

2. Godfrey Boyle, "Renewable energy: power for a sustainable future" Oxford university, third edition, 2012.

3. Ion Bolder, "Variable speed generators", Portland CRC press, second edition, 2015.

4. Rai. G.D, "Non-conventional energy sources", Khanna publisher, New Delhi, fifth edition, 2013.

5. Gray L. Johnson, "Wind energy system", prentice hall inc, 1995.

6. Andrzej M. Trzynnadlowski, "Introduction to Modern Power Electronics", Second edition, Wiley India Pvt. Ltd, 2012.

7. http://nptel.ac.in/courses/108105058/17.

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9 Hours

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**45 HOURS** 

TOTAL:

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#### 1703EE019

#### **ELECTRICAL ENERGY GENERATION UTILIZATION** L P Т C AND CONSERVATION

**PREREQUISITE:** 

1. Power Plant Engineering

2. Electrical Drives and Control

#### **COURSE OBJECTIVES:**

- 1. To introduce the knowledge in Industrial applications of electric drives.
- 2. To introduce the energy saving concept by different ways of illumination and understand the different methods of electric heating and electric welding.
- 3. To study basic concepts and applications of solar photovoltaic power conversion system and comprehend the basic concepts of wind power conversion system.
- 4. To acquire the knowledge of tariff and economic aspects in power generation.

#### **Course Outcomes:**

- After completion of the course, Student will be able to
- Recall the tractive effort for the propulsion of train, traction motors, characteristics of traction CO1 motor control, track equipment and collection gear.
- CO2 Explain the different light sources and various illumination systems for the lighting schemes
- Discuss the different methods of electric heating and types of electric welding schemes employed in CO3 industries.
- CO4 Explain the concept of solar radiation and Physical principles of the conversion of solar radiation into heat.
- Describe the aerodynamic forces acting on the blade and basic components of a WECS. CO5

Discuss the performance of a flat plate collector and cylindrical parabolic concentrating collector. CO6 UNIT I ELECTRIC DRIVESAND TRACTION 9 Hours

Fundamentals of electric drive: Types of electric drives - Merits of electric traction - choice of an electric motor application of motors for particular services - traction motors - electric braking - train movement and energy consumption - traction motor control - track equipment and collection gear; Recent trends in electric traction.

#### UNIT II **ILLUMINATION**

Introduction - definition and meaning of terms used in illumination engineering; Classification of light sources incandescent lamps, sodium vapour lamps, mercury vapour lamps, fluorescent lamps: Design of illumination systems indoor lighting schemes - factory lighting halls - outdoor lighting schemes - flood lighting - street lighting: energy saving lamps, LED.

#### UNIT III **HEATINGAND WELDING**

Introduction - advantages of electric heating - modes of heat transfer - methods of electric heating -Types -Resistance heating - Arc furnaces - Induction heating - Dielectric heating - Electric welding - Types - resistance welding - arc welding - power supply for arc welding - radiation welding.

SOLAR RADIATION, SOLARENERGY COLLECTORS AND WIND UNIT IV ENERGY

Introduction - solar radiation at the Earth's surface - solar radiation geometry; estimation of average solar radiation flat plate collectors - cover system - concentrating collector - advantages and disadvantages of concentrating collectors - parabolic concentrating collector - Introduction - basic principles of wind energy conversion - site selection considerations - basic components of a WECS (Wind Energy Conversion System) - Classification of WECS. **ENERGY AND ECONOMIC ASPECTS OF GENERATION** UNIT V 9 Hours Economic aspects of power generation; terms commonly used in system operation; various factors affecting cost of

generation; load curves - load duration curves; connected load, maximum load, peak load, base load and peak load power plants, load factor, plant capacity factor, plant use factor, demand factor, diversity factor, cost of power plant, tariffs and types; comparison of site selection criteria, introduction to energy auditing.

> TOTAL: **45 HOURS**

#### FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Solar rooftop PV system calculation for a home

2. Case study on Energy Auditing and Energy Conservation

**References:** 

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# ENVIRONMENTAL SCIENCE

(Common to all Branches of B.E/ B.Tech)

# 1901MCX01 **COURSE OBJECTIVES:**

1. To create awareness about environmental problems

2. To impart basic knowledge about environment

3. To develop and attitude of concern for the environment

**COURSE OUTCOME** 

- **CO1** Describe the physical, chemical and biological components of the eco systems and their function.
- **CO2** Describe the water quality parameter and removal of pollutants
- **CO3** Describe the scientic principles to analysis various environment implications in day to day life.
- **CO4** Describe the various environmental protection acts for key social systems affecting the environment.
- **CO5** Summarize the major diseases, women welfare child development and the impacts of population explosion

### MODULE I ECOSYSTEMS AND BIODIVERSITY

Concept of an ecosystem - structure and function of an ecosystem - producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle - energy flow in the ecosystem - ecological succession processes - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to biodiversity definition: genetic, species and ecosystem diversity - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - hot-spots of biodiversity - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - endangered and endemic species of India - conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place

### NATURAL RESOURCES **MODULE II**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and overutilization of surface and ground water, damsbenefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes - Biogas - production and uses, anaerobic digestion; case studies - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

Documentation of the effect of modern Agriculture in your nearby Village

### **MODULE III ENVIRONMENTAL POLLUTION**

Definition - Source, causes, effects and control measures of: (a) Air pollution - Mitigation procedures- Control of particulate and gaseous emission, Control of SO<sub>X</sub>, NO<sub>x</sub>, CO and HC) -Technology for capturing CO<sub>2</sub> (metallo organic frame works)(b) Water pollution - Waste water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards-role of an individual in prevention of pollution - pollution case studies.

Documentation study of local polluted site - Urban / Rural / Industrial / Agricultural. **MODULE IV** SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management -environmental ethics: Issues and possible solutions -12 Principles of green chemistry - consumerism and waste products - environment protection act - Air act - Water act - Wildlife protection act - Forest conservation act - The Biomedical Waste (Management and Handling) Rules; 1998 and amendmentsscheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards- disaster management: floods, earthquake- Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India)

### HUMAN POPULATION AND THE ENVIRONMENT **MODULE V**

Population growth, variation among nations - population explosion - family welfare programme - environment and human health - human rights - value education - HIV / AIDS - women and child welfare - Environmental impact analysis (EIA) -GIS-remote sensing-role of information technology in environment and human health - Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical report)

# 8 Hours

9 Hours

# 8 Hours

B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) | Regulations 2019 Approved in IV Academic Council Meeting Held on 25.05.2019

**ELECTRIC AND HYBRID VEHICLES** 

1903EE003 **PREREQUISITE :** 

1. Applied Chemistry

2. Electrical Machinery-I

**COURSE OBJECTIVES:** 

1. To realize the importance of electric transportation systems

2. To understand the basics of electric vehicle components and configuration

3. To understand the various charging types, comfort and safety methods and application of electric vehicle in Smart grid

# **COURSE OUTCOMES:**

After completion of the course, Student will be able to

Describe the importance and challenges of electric vehicles **CO1** 

**CO2** Explain the IC engines and transportation system

Infer about various charging system and starting system CO3

Discuss the energy storage system and battery technology in electric vehicles **CO4** 

Discuss the role power electronics and its benefits CO5

### INTRODUCTION TO ELECTRIC VEHICLES **MODULE I**

Electric and hybrid electric vehicle- History, components, types, environmental impact of electric and HEVs, electric motor and engine performance; EV and ICEV comparison; EV market-Indian scenario. 9 Hours

### IC ENGINES AND POWER TRAIN COMPONENTS **MODULE II**

Vehicle motion and the dynamic equations for the vehicle; Vehicle mass and performance; Gears; Clutches; Brakes and transmission system; Fuel economy characteristics of internal combustion engine; Series drive train; parallel, series parallel and complex drive trains and power flow in each case.

# MODULE III ELECTRIC VEHICLE ARCHITECTURE

Basic architecture of EV drive trains; PHEV; Vehicle power plant and transmission characteristics; Power flow in HEVs; Sizing of components for different hybrid drive train topologies; Impact of EVs in utility grid; Case study-Design of a BEV/HEV.

### ENERGY STORAGE SYSTEMS MODULE IV

Battery- Energy storage, Simplified models of battery, Battery parameters, Li-ion battery and battery pack management; Flywheels- Modeling for energy storage in HEV/BEV; Fuel cell and super capacitor-based energy storage; Hybridization of various energy storage devices and its advantages; Energy management system.

### ELECTRIC MACHINES AND POWER ELECTRONICS FOR HYBRID 9 Hours **MODULE V ELECTRIC VEHICLES**

DC Motor drives- Principle of operation, performance and multi-quadrant control; Induction motor drives- Control and applications in EV/HEVs; Permanent magnet motors; Switch reluctance motor drives; Sizing the propulsion motor; Torque, constant power speed ratio and machine dimensions.

Electric drives- Applications in HEV/EVs, Classifications, DC-DC converters for EV and HEV applications, Multi quadrant DC-DC converters, DC-AC inverters for EV and HEV applications, Voltage control of DC-AC inverters using PWM.

# **REFERENCES:**

1. Tom Denton, "Electric and Hybrid Vehicles", 2<sup>nd</sup> Edition, Routledge, 2020.

2. James Larminie and John Lowry, "Electric Vehicle Technology Explained", 2<sup>nd</sup> Edition, Wiley, 2012.

3. MehrdadEhsani, Yimin Gao, Stefano Lengo and KambizEbrahimi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles", 3<sup>rd</sup> Edition, CRC Press, 2019.

4. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", 2<sup>nd</sup> Edition, CRC Press, 2016.

5. https://nptel.ac.in/courses/108/102/108102121/

6. https://nptel.ac.in/courses/108/103/108103009/

7. Tom Denton, "Electric and Hybrid Vehicles", 2nd Edition, Routledge, 2020.

# **TOTAL: 45 HOURS**

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# 1903EE008

# POWER PLANT ENGINEERING

**PREREQUISITE:** 

# 1. Basic Mechanical Engineering

2. Applied Chemistry

**COURSE OBJECTIVES:** 

1. To have a detailed knowledge about energy sources available and their management.

2. To understand layout of various power plants and the function of various components of the Power plant.

3. To become familiar with operation of various power plants.

## **COURSE OUTCOMES:**

On the successful completion of the course, students will be able to

Understand the construction and operation of Thermal power plants **CO1** 

Select the suitable turbine for hydro power plants. CO2

Identify the required turbine, site for diesel and gas power plant. CO3

Explain the reactor operation and selection of site in Nuclear power plant. **CO4** 

CO5 Describe the power generation from various renewable resources.

### COAL BASED THERMAL POWER PLANTS **MODULE I**

Energy Scenario- National and international context; Layout of modern coal power plant; Types of boiler- Super critical boilers, FBC boilers; Turbines; Condensers; Steam and heat rate; Subsystems of thermal power plants; Fuel and ash handling, draught system, feed water treatment. 9 Hours

### **MODULE II HYDRO POWER PLANTS**

Introduction to hydro power plant; Layout of dams- Types; Selection of water turbine, advantages and disadvantages; Selection of site for hydro power plant; Pumped storage hydro power plant. 9 Hours

### **DIESEL AND GAS POWER PLANTS MODULE III**

Types, open and closed cycle gas turbine; Work output and thermal efficiency; Inter cooling; Regeneration-Advantages and disadvantages; Diesel engine power plant; Component and layout. 9 Hours

### NUCLEAR POWER PLANTS **MODULE IV**

Basics of nuclear energy; Layout and subsystems of nuclear power plants; Nuclear fission and fusion; Types of reactor, working of nuclear reactors, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), Canada Deuterium- Uranium Reactor (CANDU), breeder, gas cooled reactors; Safety measures for nuclear power plants. 9 Hours

MODULE V RENEWABLE ENERGY BASED POWER PLANTS

Typical layout, construction and working of wind, tidal, solar photo voltaic, solar thermal, geo thermal and biogas power plants.

# **REFERENCES:**

1. P.K. Nag, "Power Plant Engineering", 3<sup>rd</sup> Edition, Tata McGraw-Hill Publishing Company Ltd., 2014.

- 2. M.M. El-Wakil, "Power Plant Technology", Tata McGraw-Hill Publishing Company Ltd., 2010.
- 3. Black &Veatch, "Power Plant Engineering", Springer, 1996.
- Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Standard Handbook of Power Plant Engineering", 3rd Edition, 4 McGraw-Hill, 2004.
- Godfrey Boyle, "Renewable energy" Oxford University Press in association with the Open University, 2004. 5.
- http://nptel.ac.in/courses/108108077/ 6.

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# **TOTAL: 45 HOURS**

### ELECTRICAL ENERGY GENERATION UTILIZATION 1903EE014 AND CONSERVATION

# **PREREQUISITE:**

- 1. Power Plant Engineering
- 2. Electrical Drives and Control

## **COURSE OBJECTIVES:**

- 1. To impart knowledge on Generation of electrical power by conventional andNon-conventional methods.
- To introduce the energy saving concept by different ways of illumination and understand the different 2. methods of electric heating and electric welding.
- 3. To introduce the knowledge in industrial applications of electric drives and traction.
- 4. To acquire the knowledge of tariff and economic aspects in power generation.

# **COURSE OUTCOMES:**

After completion of the course, Student will be able to

- CO1 To understand the electric traction systems and their performance and industrial application of electric drives.
- CO2 To understand the principles and design of illumination systems.
- To analyze the methods of heating and welding. CO3
- CO4 Able to impart knowledge on generation of electrical power by solar and wind energy.
- CO5 To obtain the knowledge on tariff and economic aspects of generation.

# **MODULE I POWER GENERATION**

Conventional Methods: Review of Thermal, Hydro and Nuclear based power generation. Nonconventional methods: Tidal waves, Wind, Geothermal, Solar, Bio-mass, Municipal waste, Cogeneration, Effect of distributed generation on power system operation.

# MODULE II ILLUMINATION

Introduction - Definition and meaning of terms used in illumination engineering, Classification of light sources -Incandescent lamps, Sodium vapor lamps, Mercury vapor lamps, Fluorescent lamps; Design of illumination systems - Indoor lighting schemes, Factory lighting halls, Outdoor lighting schemes, Flood lighting, Street lighting, Energy saving lamps, LED.

# M ODULE IV HEATINGAND WELDING

Electric heating: Introduction, Advantages of electric heating, Modes of heat transfer, Methods of electric heating, Types - Resistance heating, Arc furnaces, Induction heating, Dielectric heating,

Electric welding: Types - Resistance welding, Arc welding, Power supply for arc welding, Radiation welding.

**ELECTRIC DRIVE AND TRACTION MODULE IV** Fundamentals of electric drive, Types of electric drives, Merits of electric traction, Requirements of electric traction system, Supply systems, Mechanics of train movement, Traction motors and control, Braking, Recent trends in Electric traction.

### ENERGY AND ECONOMIC ASPECTS OF GENERATION **MODULE V**

Economic aspects of power generation, Various factors affecting cost of generation, Load curves - Load duration curves, Connected load, Maximum load, Peak load, Base load and peak load power plants, Load factor, Plant capacity factor, Plant use factor, Demand factor, Diversity factor, Cost of power plant, Tariffs and types, Comparison of site selection criteria, Introduction to energy auditing.

# **TOTAL: 45 HOURS**

# **FURTHER READING:**

- 1. Solar rooftop PV system calculation for a home
- 2. Case study on Energy Auditing and Energy Conservation

# REFERENC

ES:

1. N.V. Surya Narayana, "Utilization of Electric Power", Wiley Eastern Limited, New Age International Limited, 1993.

- 2. J.B.Gupta, "Utilization Electric power and Electric Traction", S.K.Kataria and Sons, 2000.
- 3. R.K.Rajput, "Utilization of Electric Power", Laxmi publications Private Limited., 2007.
- 4. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", New AgeInternational Private Ltd, 2014.
- 5. H.Partab, "Utilization of Electrical Energy", Dhanpat Rai and Co., New Delhi, 2004.

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# ELECTRONIC WASTE MANAGEMENT ISSUES AND CHALLENGES

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# **COURSE OBJECTIVE**

1903EE026

To understand the overview of electronic waste To understand the impact and management of E waste

# COURSE OUTCOME

CO1 Understand the outline of electronic waste

CO2 Discuss the issues in environmental and health issues

CO3 Describe the E waste management in India

- CO4 Understand the process of recycling and recovery of materials from e-waste
- CO5 Summarize the best practices in efficient management of e-waste

 MODULE I
 OVERVIEW OF ELECTRONIC WASTE
 9 Hours

 E-waste growth; Digital dump yard; Minimization of E-waste; Hazardous substances waster
 Electrical and electronic

 equipment, batteries, plastic and flame retardants, circuit boards; Characteristics of pollutants, Pollutants in waste
 electrical and electronic

# MODULE II ENVIRONMENTAL AND PUBLIC HEALTH ISSUES

WEEE-flows; Quantity; Characteristics of a WEEE; Socio economic matters; Indian and international perspective; Health and safety implications; Toxicity concerns; Hazardous substances; E-waste health risk assessment; Case study MODULE III E-WASTE MANAGEMENT IN INDIA 9 Hours

Current Indian scenario; Environmental regulations for E-waste in India; Classification of E-waste; Components of E-waste; E-waste recycling and technology currently used in India; Mechanical processing and Biotechnology; Awareness creation; Challenges faced by formal recyclers in Delhi-NCR; Case study.

 MODULE IV
 RECYCLING AND RECOVERY OF MATERIALS FROM E-WASTE
 9 Hours

 Recycling process for the recovery of metal and materials; Recovery and recycling technologies; Bioleaching and biotechnological initiatives; Nano particles synthesis; Hydrometallurgical techniques; Pyrometallurgy.
 9 Hours

 MODULE V
 BEST PRATICES IN EFFICIENT MANAGEMENT OF E-WASTE
 9 Hours

 Current practices of E-waste management in different countries- China, Brazil, Argentina, Nigeria, Pakistan, Srilanka;
 9 Hours

 Policy comparison between developing and developed countries; Sustainable E-waste management.
 9 Hours

TOTAL: 45 HOURS

9 Hours

## **REFERENCES:**

- 1. Rakesh Johri, "E-waste: Implications, Regulations and Management in India and Current Global Best Practices", The Energy and Resources Institute (TERI) press, New Delhi, 2008.
- 2. M.N.Vara Prasad and Meththika Vithanage, "Electronic Waste Management and Treatment Technology", Butterworth-Heinmann (Elsevier), 2019.

3. R.E.Hester and R.M.Harrison, "Electronic Waste Management", RSC publishing, 2009

- 4. MeththikaVithanage and Anwesha Borthakur, "Handbook of Electronic Waste Management", Elsevier Science, 2019.
- 5. Inamuddin and Abdullah M. Asiri, "E-waste Recycling and Management", Springer International Publishing, 2019.

6. https://nptel.ac.in/courses/105/105/105105169/

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# ENERGY CONSERVATION AND ENERGY MANAGEMENT

# **COURSE OBJECTIVE**

1903EE028

To understand about energy auditing

To understand about electrical and thermal system auditing

**COURSE OUTCOME** 

After completion of the course, Student will be able to

- CO1 Explain about energy auditing
- CO2 Describe the electrical system auditing
- CO3 Discuss the mechanical system auditing
- CO4 Understand the energy conservation in major utilities

CO5 Summarize the role of energy economics in auditing

### INTRODUCTION TO ENERGY AUDITING **MODULE I**

Energy, Power, Past and present scenario of World- National energy consumption data; Environmental aspects associated with energy utilization: Energy Auditing- Need, Types, Methodology and Barriers; Role of energy managers; Instruments for energy auditing.

**ELECTRICAL SYSTEMS MODULE II** 

Components of EB billing; HT and LT supply; Transformers; Cable sizing; Concept of capacitors; Power factor improvement; Harmonics; Electric motors- Motor efficiency computation, Energy efficient motors. 9 Hours

### THERMAL SYSTEMS MODULE III

Stoichiometry; Boilers; Furnaces and Thermic fluid heaters; Efficiency computation and Encon measures; Steam-Distribution and usage, Steam traps, Condensate recovery, Flash steam utilization, Insulators and Refractories 9 Hours

ENERGY CONSERVATION IN MAJOR UTILITIES MODULE IV Energy conservation in pumps, fans, blowers, compressed air systems, refrigeration and air conditioning Systems,

### cooling towers, DG sets. **ENERGY ECONOMICS** MODULE V

Energy economics- Discount rate, Payback period, Internal rate of return, Net recent value, Life cycle costing, ESCO concept.

# **REFERENCES:**

- Witte. L.C., P.S. Schmidt and D.R. Brown, "Industrial Energy Management and Utilization", Hemisphere Publishing 1. Corporation, Washington, 1988.
- Callaghn, P.W., "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981. 2.

Dryden. I.G.C., "The Efficient Use of Energy", Butterworths, London, 1982 3.

Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982. 4.

Murphy. W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987. 5.

https://beeindia.gov.in/content/energy-auditors 6.

# TOTAL: 45 HOURS

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# 1703EE009

# POWER SYSTEM TRANSIENTS

# **PREREQUISITE :**

Transmission and Distribution. 1.

Power Electronics. 2.

# **COURSE OBJECTIVES:**

- 1. To study the generation of switching transients and their control.
- 2. To study the mechanism of lighting strokes and travelling waves.
- 3. To compute the transients in travelling waves & integrated power system.

# **COURSE OUTCOMES:**

- After completion of the course, Student will be able to
- CO1 Understand about the causes, types and effects of transients
- CO2 Investigate the phenomenon of switching transients and its effect
- CO3 Investigate the phenomenon of lightning transients and its effect
- CO4 Compute the transient response of travelling waves on transmission line
- CO5 Discuss the transients in integrated power system

### INTRODUCTION AND SURVEY OF TRANSIENTS UNIT I

Review and importance of the study of transients, causes for transients; RL circuit transient with sine wave excitation; double frequency transients ; different types of power system transients - effect of transients on power systems ,role of the study of transients in system planning.

### SWITCHING TRANSIENTS UNIT II

Over voltages due to switching transients - resistance switching, load switching, normal and abnormal switching transients; current suppression, current chopping; capacitance switching-capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients; ferro resonance.

### UNIT III LIGHTNING TRANSIENTS

Review of the theories in the formation of clouds and charge formation rate of charging of thunder clouds; mechanism of lightning discharges and characteristics of lightning strokes; model for lightning stroke; factors contributing to good line design - protection from lightning.

### TRAVELING WAVES ON TRANSMISSION LINE UNIT IV

Computation of transients; transient response of systems with series and shunt lumped parameters and distributed lines ;traveling wave concept -step response, Bewely's lattice diagram; standing waves and natural frequencies; reflection and refraction of travelling waves.

### TRANSIENTS IN INTEGRATED POWER SYSTEM UNIT V

The short line and kilometric fault ;distribution of voltages in a power system; line dropping and load rejection ; voltage transients on closing and reclosing lines ; over voltage induced by faults ;switching surges on integrated system; qualitative application of EMTP for transient computation.

# FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Analysis Power System Transient Using Wavelet Transform.

2. Case Study about the Effect of transients developed in Home appliances.

# **REFERENCES:**

1. Allan Greenwood, "Electrical Transients in Power Systems", Wiley Inter Science, New York, 2<sup>nd</sup> Edition, 2010.

2. Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., 2nd Edition, 2009.

3. Indulkar.C.S, Kothari.D.P, Ramalingam.K, 'Power System Transients - A statistical approach', PHI Learning Private Limited, 2<sup>nd</sup> Edition, 2010.

4. Ramanujam.R, "Computational Electromagnetic Transients: Modeling, Solution Methods and Simulation" I K International Publishing House Pvt. Ltd, 2014.

5. Sakis Meliopoulis.A.P, "Power System Grounding and Transients: An Introduction" CRC Press; 1st Edition 2015

# 9 Hours

# Total: 45 HOURS

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# ELECTRIC AND HYBRID VEHICLES

# **PREREQUISITE :**

1703EE010

1. Applied Chemistry

2. Electrical Machinery-I

**COURSE OBJECTIVES:** 

- 1. To realize the importance of electric transportation systems
- 2. To understand the basics of electric vehicle components and configuration
- 3. To understand the various charging types, comfort and safety methods and application of electric
- vehicle in Smart grid

# **COURSE OUTCOMES:**

- After completion of the course, Student will be able to
- CO1 Describe the importance and challenges of electric vehicles
- Discuss the energy storage system and battery technology in electric vehicles CO2
- CO3 Infer about various charging system and starting system
- Explain the role of hybrid electric vehicle with its safety CO4
- Discuss the emerging technologies and its benefits CO5

### **ELECTRIC VEHICLES** UNIT I

History of modern transportation; importance of different transportation development strategies to future oil supply; introduction to electric vehicles; history of hybrid and electric vehicles, social, environmental importance and key challenges of hybrid and electric vehicles; specifications of PHEVS, BEVS, EVS; plug-in hybrid vehicle characteristics; the future of electric vehicles.

### ENERGY STORAGE AND BATTERY TECHNOLOGY UNIT II

Introduction to Energy Storage system; Battery Requirements for HEVs, PHEVs, and EVs; Types of batteries; Properties of batteries; Working principle and construction of lead-acid, nickel cadmium, nickel metal hydride, lithium ion Batteries; Maintenance and charging of batteries; Diagnosing lead-acid battery faults; Advanced battery technology; Developments in electrical storage; Case studies.

### CHARGING AND STARTING SYSTEMS UNIT III

Requirements of the charging system; Charging system principles; Alternators and charging circuits; Diagnosing charging system faults; Advanced charging system technology; New developments in charging systems; Requirements of the starting system; Starter motors and circuits; Types of starter motor; Diagnosing starting system faults; Advanced starting system technology; New developments in starting systems; Case studies.

### HYBRID ELECTRIC VEHICLE DRIVE TRAIN AND SAFETY UNIT IV

Requirement of drive train; Architecture of hybrid drive train; Sizing of components- Series configuration, Parallel configuration, parallel and series configuration; Security-Airbags and belt tensioners, Diagnosing comfort and safety system faults, Advanced comfort and safety systems technology; New developments in comfort and safety systems 9 Hours

### **EMERGING TECHNOLOGIES** UNIT V

Introduction-Electric Vehicle Supply Equipment, Smart vehicles in smart grid; Vehicle-to-grid technologies-Unidirectional and Bidirectional; Need of Charging Station Selection (CSS) server, Smart grid technologies-Applications / Benefits, Smart meter, Smart charger; Purpose and benefits; Ethics in road safety.

> Total: 45 Hours

# FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

- 1. Wireless charging of electric vehicles.
- 2. Monitoring and control of driverless electric vehicle.

# **REFERENCES:**

- 1. M. Ehsani, Y. Gao, and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles:
- Fundamentals, Theory and Design", CRC Press, Second Edition, 2009.
- 2. Tom Denton, "Automobile Electrical and Electronic Systems", Elsevier Butterworth-Heinemann, Fourth Edition, 2011.
- 3. Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, First Edition, 2014.
- 4. Iqbal Hussain, "Electric & Hybrid Vehicles Design Fundamentals", Second Edition, CRC Press, 2011.
- 5. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, Second Edition, 2015.
- 6. NPTEL Course, "Historical Journey of Hybrids and Electric Vehicle", by Dr. Praveen Kumar and Prof. S. Majhi, IIT-Guwahati.

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# **RENEWABLE ENERGY SOURCES**

# 1703EE024

# PREREQUISITE:

1. Physics

**COURSE OBJECTIVES:** 

- To understand the classification and availability of energy resources. 1:
- To analyze the issues related with harnessing of energy generation from renewable energy 2. sources.
- 3. To design an energy generation system with locally available renewable energy resources.

# COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1 Acquire the knowledge about various renewable energy sources.
- CO2 Explain the technological basis for harnessing renewable energy sources.
- CO3 Gain knowledge of low electrical energy generation.
- CO4 Identify various available renewable energy sources and techniques to utilize them effectively.
- Acquire the knowledge of modern energy conversion technologies. CO5

### INTRODUCTION TO ENERGY SOURCES UNIT I

Energy consumption as a measure of prosperity; world energy scenario - distributed generation - deregulation and restructured electricity market.

### SOLAR ENERGY UNIT II

Solar radiation and its measurements – solar constant-solar radiation at the earth's surface- solar radiation geometrysolar radiation measurements- solar energy collectors - flat plate collectors - concentrating collectors - solar electric power generation: solar photovoltaic - principle of photovoltaic conversion of solar energy - types of PV cells and fabrication.

### WIND ENERGY UNIT III

Introduction - power in the wind - forces on blades and thrust on turbines - wind energy conversion - site selection considerations - basic components of WECS - classification- advantages and disadvantages.

### BIOENERGY **UNIT IV**

Introduction - biomass conversion technologies - bio gas generation - factors affecting bio digestion or generation of gas - classification of bio gas plants - advantages and disadvantages -materials used for biogas plant - selection of site for biogas plant.

### INTRODUCTION TO ALTERNATE SOURCES UNIT V

Mini & micro hydel plant - magneto hydro dynamic power (MHD) - introduction - MHD systems - thermo electric power - basic principles - thermionic generation - thermo nuclear energy - the basic: nuclear fusion reactor, ocean, tidal, fuel cells. **45 HOURS** 

- FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :
  - 1. Energy Storage Systems
  - 2. Power Converters for Stand Alone and Grid Connected Renewable Energy Systems

# **REFERENCES:**

- 1. G. D. Rai, "Non-Conventional Energy Sources", 5th Edition, Eleventh Reprint, Khanna Publishers, 2014.
- 2. B. H. Khan, "Non-conventional Energy Resources", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2009, New Delhi.
- 3. S. P. Sukhatme, "Solar Energy; Principles of Thermal Collection and Storage", 3rd Edition, Tata McGraw Hill, 2008,
- 4. Bent Sorensen, "Renewable Energy Conversion, Transmission and Storage", 2<sup>nd</sup> Edition, Academic Press, 2000, New York.
- 5. Godfrey Boyle, "Renewable Energy; Power for a sustainable future", 3<sup>rd</sup> Edition, Oxford University Press, 2012.

6. Khandelwal KC, Mahdi SS, "Biogas Technology – A Practical Handbook", Tata McGraw Hill, 1998.

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guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

# TOTAL: 30 PERIODS

# **OUTCOMES:**

- Ability to review, prepare and present technological developments
- Ability to face the placement interviews

# EE6701

# HIGH VOLTAGE ENGINEERING

# LT P C 3003

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# **OBJECTIVES:**

- To understand the various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination.

OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS UNITI

Causes of over voltages and its effects on power system - Lightning, switching surges and temporary overvoltages, Corona and its effects - Reflection and Refraction of Travelling waves- Protection against overvoltages.

### DIELECTRIC BREAKDOWN UNIT II

Gaseous breakdown in uniform and non-uniform fields - Corona discharges - Vacuum breakdown -Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality - Breakdown mechanisms in solid and composite dielectrics.

# GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS UNIT III Generation of High DC, AC, impulse voltages and currents - Triggering and control of impulse generators.

MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9 **UNIT IV** High Resistance with series ammeter - Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters -Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

## HIGH VOLTAGE TESTING & INSULATION COORDINATION UNIT V

High voltage testing of electrical power apparatus as per International and Indian standards - Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination.

**TOTAL: 45 PERIODS** 

# OUTCOMES:

Ability to understand and analyze power system operation, stability, control and protection.

## TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.

2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second

# ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION EE6801

# **OBJECTIVES:**

To analyze the various concepts behind renewable energy resources.

- To introduce the energy saving concept by different ways of illumination.
- To understand the different methods of electric heating and electric welding.
- To introduce knowledge on Solar Radiation and Solar Energy Collectors
- To introduce concepts of Wind Energy and its utilization

### ELECTRIC DRIVES AND TRACTION UNIT I

Fundamentals of electric drive - choice of an electric motor - application of motors for particular services - traction motors - characteristic features of traction motor - systems of railway electrification electric braking - train movement and energy consumption - traction motor control - track equipment and collection gear.

### ILLUMINATION UNIT II

Introduction - definition and meaning of terms used in illumination engineering - classification of light sources - incandescent lamps, sodium vapour lamps, mercury vapour lamps, fluorescent lamps design of illumination systems - indoor lighting schemes - factory lighting halls - outdoor lighting schemes - flood lighting - street lighting - energy saving lamps, LED.

### HEATING AND WELDING UNIT III

Introduction - advantages of electric heating - modes of heat transfer - methods of electric heating resistance heating - arc furnaces - induction heating - dielectric heating - electric welding - types resistance welding - arc welding - power supply for arc welding - radiation welding.

## SOLAR RADIATION AND SOLAR ENERGY COLLECTORS UNIT IV

Introduction - solar constant - solar radiation at the Earth's surface - solar radiation geometry estimation of average solar radiation - physical principles of the conversion of solar radiation into heat - flat-plate collectors - transmissivity of cover system - energy balance equation and collector efficiency - concentrating collector - advantages and disadvantages of concentrating collectors performance analysis of a cylindrical - parabolic concentrating collector - Feedin Invertors.

# WIND ENERGY

UNIT V Introduction - basic principles of wind energy conversion - site selection considerations - basic components of a WECS (Wind Energy Conversion System) - Classification of WECS - types of wind Turbines - analysis of aerodynamic forces acting on the blade - performances of wind.

# TOTAL : 45 PERIODS

# OUTCOMES:

- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.

# TEXT BOOKS:

- 1. N.V. Suryanarayana, "Utilisation of Electric Power", Wiley Eastern Limited, New Age International Limited, 1993.
- 2. J.B.Gupta, "Utilisation Electric power and Electric Traction", S.K.Kataria and Sons, 2000.
- 3. G.D.Rai, "Non-Conventional Energy Sources", Khanna Publications Ltd., New Delhi, 1997.

# **REFERENCES:**

1. R.K.Rajput, Utilisation of Electric Power, Laxmi publications Private Limited., 2007.

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# OUTCOMES:

Ability to understand and analyze power system operation, stability, control and protection.

# TEXT BOOKS:

- 1. R.Mohan Mathur, Rajiv K.Varma, "Thyristor Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, Inc, 2002.
- 2. Narain G. Hingorani, "Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems", Standard Publishers Distributors, Delhi- 110 006, 2011.
- 3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008.

# **REFERENCES:**

- 1. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.
- 2. V.K.Sood, HVDC and FACTS controllers Applications of Static Converters in Power System, APRIL 2004, Kluwer Academic Publishers, 2004.
- 3. Xiao Ping Zang, Christian Rehtanz and Bikash Pal, "Flexible AC Transmission System: Modelling and Control" Springer, 2012.

# EE6005

# POWER QUALITY

# **OBJECTIVES:**

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

### INTRODUCTION TO POWER QUALITY UNIT I

Terms and definitions: Overloading - under voltage - over voltage. Concepts of transients - short duration variations such as interruption - long duration variation such as sustained interruption. Sags and swells - voltage sag - voltage swell - voltage imbalance - voltage fluctuation - power frequency variations. International standards of power quality. Computer Business Equipment Manufacturers Associations (CBEMA) curve.

### VOLTAGE SAGS AND INTERRUPTIONS UNIT II

Sources of sags and interruptions - estimating voltage sag performance. Thevenin's equivalent source - analysis and calculation of various faulted condition. Voltage sag due to induction motor starting. Estimation of the sag severity - mitigation of voltage sags, active series compensators. Static transfer switches and fast transfer switches.

### **OVERVOLTAGES** UNIT III

Sources of over voltages Capacitor switching - lightning - ferro resonance. Mitigation of voltage swells - surge arresters - low pass filters - power conditioners. Lightning protection - shielding - line

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LTPC

arresters - protection of transformers and cables. An introduction to computer analysis tools for transients, PSCAD and EMTP.

# UNIT IV HARMONICS

Harmonic sources from commercial and industrial loads, locating harmonic sources.Power system response characteristics - Harmonics Vs transients. Effect of harmonics - harmonic distortion - voltage and current distortion - harmonic indices - inter harmonics – resonance. Harmonic distortion evaluation - devices for controlling harmonic distortion - passive and active filters. IEEE and IEC standards.

# UNIT V POWER QUALITY MONITORING

Monitoring considerations - monitoring and diagnostic techniques for various power quality problems - modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - power line disturbance analyzer – quality measurement equipment - harmonic / spectrum analyzer - flicker meters - disturbance analyzer. Applications of expert systems for power quality monitoring.

# **TOTAL : 45 PERIODS**

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# OUTCOMES:

Ability to understand and analyze power system operation, stability, control and protection.

# TEXT BOOKS:

- 1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power' Systems Quality' McGraw Hill, 2003. (For Chapters 1, 2, 3, 4 and 5).
- Eswald.F.Fudis and M.A.S.Masoum, "Power Quality in Power System and Electrical Machines," Elseviar Academic Press, 2013.
- 3. J. Arrillaga, N.R. Watson, S. Chen, 'Power System Quality Assessment', Wiley, 2011.

# **REFERENCES:**

- 1. G.T. Heydt, 'Electric Power Quality', 2<sup>nd</sup> Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)
- 2. M.H.J Bollen, 'Understanding Power Quality Problems: Voltage Sags and Interruptions', (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)
- 3. G.J.Wakileh, "Power Systems Harmonics Fundamentals, Analysis and Filter Design," Springer 2007.
- 4. E.Aeha and M.Madrigal, "Power System Harmonics, Computer Modelling and Analysis, "Wiley India, 2012.
- R.S.Vedam, M.S.Sarma, "Power Quality VAR Compensation in Power Systems," CRC Press 2013.
- 6. C. Sankaran, 'Power Quality', CRC press, Taylor & Francis group, 2002.

Digital Converter-UART-Baud rate selection-Data handling circuit-Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

### INTRODUCTION TO ARM PROCESSOR UNIT IV

ARM Architecture -ARM programmer's model -ARM Development tools- Memory Hierarchy -ARM Assembly Language Programming-Simple Examples-Architectural Support for Operating systems.

### ARM ORGANIZATION UNIT V

3-Stage Pipeline ARM Organization- 5-Stage Pipeline ARM Organization-ARM Instruction Execution- ARM Implementation- ARM Instruction Set- ARM coprocessor interface- Architectural support for High Level Languages - Embedded ARM Applications.

**TOTAL: 45 PERIODS** 

# OUTCOMES:

- To understand and apply computing platform and software for engineering problems.
- To understand ethical issues, environmental impact and acquire management skills. •

# TEXT BOOKS:

- 1. Peatman, J.B., "Design with PIC Micro Controllers" Pearson Education, 3<sup>rd</sup> Edition, 2004.
- 2. Furber, S., "ARM System on Chip Architecture" Addison Wesley trade Computer Publication, 2000.

# **REFERENCE:**

1. Mazidi, M.A., "PIC Microcontroller" Rollin Mckinlay, Danny causey Printice Hall of India, 2007.

### POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS LTPC EE6009 3003

# **OBJECTIVES:**

- To Provide knowledge about the stand alone and grid connected renewable energy systems.
- To equip with required skills to derive the criteria for the design of power converters for renewable energy applications.
- To analyse and comprehend the various operating modes of wind electrical generators and solar energy systems.
- To design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.
- To develop maximum power point tracking algorithms.

### INTRODUCTION UNIT I

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Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION UNIT II Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

# UNIT III POWER CONVERTERS

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

# UNIT IV ANALYSIS OF WIND AND PV SYSTEMS

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

# UNIT V HYBRID RENEWABLE ENERGY SYSTEMS

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT). TOTAL : 45 PERIODS

# OUTCOMES:

- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.

# **TEXT BOOK:**

- 1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
- 2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi, 2009.

# **REFERENCES:**

- 1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
- 2. Ion Boldea, "Variable speed generators", Taylor & Francis group, 2006.
- 3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
- 4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.
- 5. Andrzej M. Trzynnadlowski, 'Introduction to Modern Power Electronics', Second edition, wiley India Pvt. Ltd, 2012.

# EE6010

# HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

# LT P C 3 0 0 3

# **OBJECTIVES:**

- To understand the concept, planning of DC power transmission and comparison with AC Power transmission.
- To analyze HVDC converters.
- To study about the HVDC system control.
- To analyze harmonics and design of filters.
- To model and analysis the DC system under study state.

# UNIT I INTRODUCTION

DC Power transmission technology – Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system – Planning for HVDC transmission – Modern trends in HVDC technology – DC breakers – Operating problems – HVDC transmission based on VSC – Types and applications of MTDC systems.

B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) | Regulations2017 Approved in I Academic Council Meeting held on16-07-2017

# 1701CH201

# ENVIRONMENTAL STUDIES

(Common to all B.E. / B. Tech Degree Programmes)

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3	0	0	3
3	v	U	J

## **COURSE OBJECTIVES:**

- 1. Realize the interdisciplinary and holistic nature of the environment.
- 2. Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development.
- 3. Recognize the socio-economic, political and ethical issues in environmental science.

# **COURSE OUTCOMES:**

- On the Successful completion of the course, Students will be able to
- CO1: Describe the importance of ecosystem and its conservation.
- CO2: Differentiate various natural resources and the urgent need to conserve the natural resources.
- CO3: Explain the different types of pollution and its effects.
- CO4: Describe the various environmental protection acts.
- CO5: Explain the major diseases, women, child development and the impacts of population explosion.

### ECOSYSTEMS AND BIODIVERSITY UNIT I

Concept of an ecosystem - structure and function of an ecosystem - producers, consumers and decomposers -Oxygen cycle and Nitrogen cycle - energy flow in the ecosystem - ecological succession processes -Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) -Introduction to biodiversity definition: genetic, species and ecosystem diversity - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - hot - spots of biodiversity - threats to biodiversity: habitat loss, poaching of wildlife, man - wildlife conflicts - endangered and endemic species of India - conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place.

### NATURAL RESOURCES UNIT II

Forest resources: Use and over - exploitation, deforestation, case studies - timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and overutilization of surface and ground water, dams-benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies -Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes - Biogas - production and uses, anaerobic digestion; case studies - Land resources: Land as a resource, land degradation, man induced landslides, soil erosionanddesertificationroleofanindividualinconservationofnaturalresources-Equitableuseof

Resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village.

### UNIT III **ENVIRONMENTAL POLLUTION**

Definition - Source, causes, effects and control measures of: (a) Air pollution - Mitigation procedures - Control of particulate and gaseous emission, Control of SOx, NOx, CO and HC) - Technology for capturing CO2(metalloorganicframeworks)(b)Waterpollution-Wastewatertreatmentprocesses. (c)Soilpollution

soil waste management: causes, effects and control measures of municipal solid wastes - (d) Marine pollution(e)Noisepollution(f)Thermalpollution(g)Nuclearhazards-roleofanindividualinpreventionof

pollution - pollution case studies. Documentation study of local polluted site - Urban / Rural / Industrial / Agricultural. 8 Hours

### SOCIAL ISSUES AND THE ENVIRONMENT **UNIT IV**

From unsustainable to sustainable development - urban problems related to energy - water conservation, rain water harvesting, watershed management - environmental ethics: Issues and possible solutions - 12 Principles of green chemistry - consumerism and waste products - environment protection act - Air act - Water act - Wildlife protection act - Forest conservation act - The Biomedical Waste (Management and Handling) Rules; 1998 and amendments - scheme of labeling of environmentally friendly products (Ecomark) central and state

pollution control boards - disaster management: floods, earthquake - Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India).

### HUMAN POPULATION AND THE ENVIRONMENT UNIT V

Population growth, variation among nations - population explosion - family welfare programme - environment and human health - human rights - value education - HIV / AIDS - women and child welfare - Environmental impact analysis (EIA) - GIS - remote sensing - role of information technology in environment

and human health - Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical report).

8 Hours

9 Hours

# **10 Hours**

10 Hours

B.E. Electrical and Electronics Engineering | E.G.S. Pillay Engineering College (Autonomous) | Regulations2017 Approved in II Academic Council Meeting held on05-05-2018

# 1702EE304

# **POWER PLANT ENGINEERING**

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**PREREQUISITE :** 

1. Basic Mechanical Engineering

2. Applied Chemistry

**COURSE OBJECTIVES:** 

- 1. To have a detailed knowledge about energy sources available and their management.
- 2. To understand layout of various power plants and the function of various components of the Power plant.
- 3. To become familiar with operation of various power plants.

**COURSE OUTCOMES:** 

- On the successful completion of the course, students will be able to
- Understand the construction and operation of Thermal power plants.(K2) CO1
- CO2 Select the suitable turbine for hydro power plants. (K2)
- CO3 Identify the required turbine, site for diesel and gas power plant. (K2)
- CO4 Explain the reactor operation and selection of site in Nuclear power plant. (K2)
- CO5 Describe the power generation from various renewable resources. (K2)

### UNIT I COAL BASED THERMAL POWER PLANTS

Layout of modern coal power plant; types of boiler; super critical boilers, FBC boilers; Turbines; condensers; steam and heat rate; subsystems of thermal power plants - fuel and ash handling, draught system, feed water Treatment; Energy Scenario - National, international context.

### UNIT II **HYDRO POWER PLANTS**

Introduction to hydro power plant - layout of dams; types, selection of water turbine, advantages and Disadvantages; selection of site for hydro power plant; pumped storage hydro power plant.

### UNIT III DIESEL AND GAS POWER PLANTS

Types, open and closed cycle gas turbine, work output & thermal efficiency; inter cooling - regeneration -Advantages and disadvantages; Diesel engine power plant - component and layout.

### UNIT IV NUCLEAR POWER PLANTS

Basics of nuclear energy - layout and subsystems of nuclear power plants, nuclear fission and fusion; types of reactor, working of nuclear reactors, boiling water reactor (BWR), pressurized water reactor(PWR), Canada deuterium- uranium reactor (CANDU), breeder, gas cooled reactors; safety measures for nuclear power plants. 9 Hours

### UNIT V POWER FROM RENEWABLE ENERGY

Typical layout and associated components including turbines; Principle; Construction and working of wind, tidal, solar photo voltaic, solar thermal, geo thermal, biogas.

# FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

- 1. MHD/OTEC power plants
- 2. New and alternate energy sources

# **REFERENCES:**

1. P.K. Nag, -PowerPlantEngineering, Tata McGraw-HillPublishing CompanyLtd., Third Edition, 2014.

- 2. M.M. El-Wakil, -PowerPlantTechnologyl, Tata McGraw-HillPublishing CompanyLtd., 2010.
- 3. Black &Veatch, -PowerPlantEngineeringlSpringer, 1996.
- 4. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, -Standard Handbook of Power Plant Engineering Third Edition, McGraw-Hill, 2004.
- 5. Godfrey Boyle, —Renewable energy Oxford University Press in association with the Open University, 2004.

# 9 Hours

9 Hours

9 Hours

# 9 Hours

**TOTAL: 45 HOURS** 

## ENVIRONMENTAL SCIENCE AND ENGINEERING GE6351

# LTPC 3003

12

# **OBJECTIVES:**

To the study of nature and the facts about environment.

- To finding and implementing scientific, technological, economic and political solutions to • environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste . management.

## ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY UNIT I

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment - concept of an ecosystem - structure and function of an ecosystem - producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle - energy flow in the ecosystem - ecological succession processes - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to biodiversity definition: genetic, species and ecosystem diversity - biogeographical classification of India - value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values -Biodiversity at global, national and local levels - India as a mega-diversity nation - hot-spots of biodiversity - threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts endangered and endemic species of India - conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems - pond, river, hill slopes, etc.

### ENVIRONMENTAL POLLUTION UNIT II

Definition - causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO2, NOX, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters - physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes - (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards-role of an individual in prevention of pollution - pollution case studies -Field study of local polluted site - Urban / Rural / Industrial / Agricultural.

### NATURAL RESOURCES UNIT III

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people - Water resources. Use and overutilization of surface and ground water, dams-benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes - Biogas - production and uses anaerobic digestion; case studies - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins -Biochemical

degradation of pollutants, Bioconversion of pollutants.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

# UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides.

Public awareness.

# UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

# TOTAL: 45 PERIODS

# OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

# **TEXT BOOKS :**

- 1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
- 2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

# **REFERENCES**:

- 1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
- 2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
- 3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
- 4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press 2005.

# **TEXT BOOKS:**

- 1. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
- 2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.
- 3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085,8086,8051,McGraw Hill Edu,2013.

# **REFERENCES:**

- 1. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.
- 2. N.Senthil Kumar, M.Saravanan, S.Jeevananthan, 'Microprocessors and Microcontrollers', Oxford.2013.
- 3. Valder Perez, "Microcontroller Fundamentals and Applications with Pic," Yeesdee Publishers, Tayler & Francis, 2013.

# ME6701

# POWER PLANT ENGINEERING

# LTPC 3003

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10

# OBJECTIVES:

Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

## COAL BASED THERMAL POWER PLANTS UNITI

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants - Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 10 UNIT II Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

### NUCLEAR POWER PLANTS UNIT III

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

POWER FROM RENEWABLE ENERGY UNIT IV Hydro Electric Power Plants - Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems

ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 8 UNIT V Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

# TOTAL: 45 PERIODS

# OUTCOMES:

- Upon completion of this course, the Students can able to understand different types of power plant, and its functions and their flow lines and issues related to them.
- Analyse and solve energy and economic related issues in power sectors.

# TEXT BOOK:

1. P.K. Nag, Power Plant Engineering, Tata McGraw - Hill Publishing Company Ltd., Third Edition, 2008.

# **REFERENCES:**

- 1. M.M. El-Wakil, Power Plant Technology, Tata McGraw Hill Publishing Company Ltd., 2010.
- 2. Black & Veatch, Springer, Power Plant Engineering, 1996.
- 3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, Standard Handbook of Power Plant Engineering, Second Edition, McGraw - Hill, 1998.
- 4. Godfrey Boyle, Renewable energy, Open University, Oxford University Press in association with the Open University, 2004.

# EE6503

# POWER ELECTRONICS

# **OBJECTIVES:**

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and various configurations.

### POWERSEMI-CONDUCTOR DEVICES UNIT 1

Study of switching devices, Diode, SCR, TRIAC, GTO, BJT, MOSFET, IGBT-Static and Dynamic characteristics - Triggering and commutation circuit for SCR- Design of Driver and snubber circuit.

### PHASE-CONTROLLED CONVERTERS UNIT - II

2-pulse,3-pulse and 6-pulseconverters- performance parameters -Effect of source inductance- Gate Circuit Schemes for Phase Control–Dual converters.

### DC TO DC CONVERTER UNIT III

Step-down and step-up chopper-control strategy-Forced commutated chopper-Voltage commutated, Current commutated, Load commutated, Switched mode regulators- Buck, boost, buck- boost converter, Introduction to Resonant Converters.

57

9

LTPC

### UNIT IV OPTIMAL CONTROL

Introduction - Time varying optimal control - LQR steady state optimal control - Solution of Ricatti's equation - Application examples.

### OPTIMAL ESTIMATION UNIT V

Optimal estimation - Kalman Bucy Filter-Solution by duality principle-Discrete systems- Kalman Filter- Application examples ..

**TOTAL: 45 PERIODS** 

9

# OUTCOMES:

Ability to apply advanced control theory to practical engineering problems.

# **TEXT BOOKS :**

1. K. P. Mohandas, "Modern Control Engineering", Sanguine Technical Publishers, 2006.

- 2. G. J. Thaler, "Automatic Control Systems", Jaico Publishing House, 1993.
- 3. M.Gopal, Modern Control System Theory, New Age International Publishers, 2002.

# **REFERENCES:**

1. William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Tayler and Francies Group, 2011.

- 2. Ashish Tewari, 'Modern Control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.
- 3. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
- 4. T. Glad and L. Ljung,, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.
- 5. D.S.Naidu, "Optimal Control Systems" First Indian Reprint, CRC Press, 2009.

# EE6002

# POWER SYSTEM TRANSIENTS

# LTPC 3003

# **OBJECTIVES:**

- To study the generation of switching transients and their control using circuit theoretical concept.
- To study the mechanism of lighting strokes and the production of lighting surges.
- To study the propagation, reflection and refraction of travelling waves.
- To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

### INTRODUCTION AND SURVEY UNITI

Review and importance of the study of transients - causes for transients. RL circuit transient with sine wave excitation - double frequency transients - basic transforms of the RLC circuit transients. Different types of power system transients - effect of transients on power systems - role of the study of transients in system planning.

### SWITCHING TRANSIENTS UNIT

Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient

voltage across the load and the switch - normal and abnormal switching transients. Current suppression - current chopping - effective equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients - ferro resonance.

# UNIT III LIGHTNING TRANSIENTS

Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

# UNIT IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS

Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely's lattice diagram - standing waves and natural frequencies - reflection and refraction of travelling waves.

# UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM

The short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults -switching surges on integrated system Qualitative application of EMTP for transient computation.

**TOTAL: 45 PERIODS** 

# OUTCOMES:

Ability to understand and analyze power system operation, stability, control and protection.

# TEXT BOOKS:

- 1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter Science, New York, 2<sup>nd</sup> Edition, 1991.
- 2. Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., Second Edition, 2009.
- 3. C.S. Indulkar, D.P.Kothari, K. Ramalingam, 'Power System Transients A statistical approach', PHI Learning Private Limited, Second Edition, 2010.

# **REFERENCES:**

- 1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.
- 2. R.D. Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.
- 3. Y.Hase, Handbook of Power System Engineering," Wiley India, 2012.
- 4. J.L.Kirtley, "Electric Power Principles, Sources, Conversion, Distribution and use," Wiley, 2012.

1701MGX01

PROFESSIONAL ETHICS

# PREREQUISITE:

- 1. Basic understanding of business management
- Basic understanding of human values 3

# COURSE OBJECTIVES:

- To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas. Professional Ideals and Victure 1. dilemmas, Professional Ideals and Virtues
- To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, Exposure to Safety and Risk, Risk Benefit Analysis
- To have an idea about the Collegiality and Loyalty, Collective Bargaining, Confidentiality, 3 Occupational Crime, Professional, Employee, Intellectual Property Rights
- To have an adequate knowledge about MNC"s, Business, Environmental, Computer Ethics, 4 Honesty, Moral Leadership, sample Code of Conduct.
- To use the engineering principles to update and maintain the technical skills. 5

### ENGINEERING ETHICS UNIT

Senses of "Engineering Ethics" - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg"s theory - Gilligan"s theory - Consensus and Controversy - Professions and Professionalism - Professional Ideals and Virtues - Uses of Ethical Theories.

### ENGINEERING AS SOCIAL EXPERIMENTATION UMTIÌ

Engineering as Experimentation - Engineers as responsible Experimenters - Research Ethics - Codes of Ethics - Industrial Standards - A Balanced Outlook on Law - The Challenger Case Study.

## ENGINEER'S RESPONSIBILITY FOR SAFETY UNIT III

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator"s Approach to Risk - Case Studies on Chernobyl, Bhopal MIC and Sterlite copper.

RESPONSIBILITIES AND RIGHTS Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR) -Discrimination.

Muttinational Corporations - Business Ethics - Environmental Ethics - Computer Ethics - Role in Technological Development - Weapons Development - Engineers as Managers - Consulting Engineers -Engineers as Expert Witnesses and Advisors - Honesty - Moral Leadership - Sample Code of Conduct. TOTAL: 45 HOURS

# FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR:

Case study on Hiroshima and Nagasaki

# COURSE OUTCOMES:

CO1: Articulate engineering ethics theory with sustained lifelong learning to strengthen autonomous engineering

CO2: Fortify the competency with facts and evidences to responsibly confront moral issues raised by technological

CO3: Contribute to shape a better world by taking responsible and ethical actions to improve the environment and

CO4: Be an example of faith, character and high professional ethics, and cherish the workplace responsibilities,

CO5: Be Proficient in analytical abilities for moral problem solving in engineering situations through

exploration and assessment of ethical problems supported by established experiments.

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999. 2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003

3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford

4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi

2004

Page | 2

# 9 Hours

9 Hours

9 Hours

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# 9 Hours

# 9 Hours

CYBER FORENSICS				C
10	L	T	P	
ST019 will understand and learn various cyber for i	3	0	0	5
source will understand and learn various cyber forensics and security technique	s in real f	inte et	NER	TETT
NT This course will understand and learn various cyber forensics and security technique NT This course will understand and learn various cyber forensics and security technique NT E OBJECTIVES: NT E OBJECTIVE	P 180 P-9-90 1			
NEE OBJECT				
Learn the security issues of the application layer Be exposed to security issues of the application layer				
Be exposed to determine the approximation rayer Learn computer forensics				
Be familiar to analyze and validate forensics data				
NETWORK LAYER AND TRANSPORT LAYER SECURITY		0	n L	lours
All Incarbon II Automatican II I in			711	For-
The layer security - SSL protocol-Cryptographic Computations - TLS r-Key Maria	jement ri	1010001	102 12	300
ALL CECUDITY & EIDEWALLS	and the second se	and the second se		
IT I Figure 11s for Toursed Surgery Della Street		í.	91	fours
MINE-Internet Firewalls for Trusicu System. Koles of Firewalls - Firewall rel	ated term	inolog	3 - 131	25 05
1 VIT - SMIME - Internet Firewalls for Trusted System: Roles of Firewalls - Firewall rel				
UT III COMPUTER FORENSICS			9 F	lours
UTI III / COMPETER FORE, ISPES	& Identit	y Fran	d– Tyj	pes of
Inditional Computer Crimes–Problems associated with Computer Crime–Identity Theft Inditional Computer Crimes–Incident and incident response methodology – Forensic duplication and CF techniques –Incident and incident response methodology – Forensic duplication and Forensic Creating response tool kit and IR team. – Forensics Technology and Systems	l investig	2000-	Prepa	1200
CF techniques – Incidenti and incident response methodology – rotensic duplication and treating response tool kit and IR team. – Forensics Technology and Systems it IR: Creating Course Acquisition	- Unders	tandin	g Cot	oputer
- Valla Acquisition:				
EVIDENCE COLLECTION AND TOKENSICS TOOLS		-		Hours
Crime and Incident Scenes - Working with Windows and LUS Systems-	Current C	omput	er For	ensits
sola Software Hardware Tools.				
ANALYSIS AND VALIDATION				Hours
Lithering Forensics Data - Data Hiding Lechniques - Performing Remote Acquisit	ion – №	twork	Foren	sics -
Email Investigations – Cell Phone and Mobile Devices Forensics				
	TO	TAL:	45 1	lours
COURSE OUTCOMES:				
At the end of this course, students will be able to,				
CO1: Discuss the security issues network layer and transport layer				
CO2: Apply security principles in the application layer				
CO3: Explain computer forensics tools				
CO4: Understand the evidence collection and use forensic tools				
CO5: Analysis and Validate various forensics data				
REFERENCES:				
1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms	and Proto	cols".	Wiley	
Publications, 2014.		,		
2. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", (	Cengage I	Learnir	ng. Ind	ia.
Edition, 2012	0.0		-	
<ol> <li>John R.Vacca, "Computer Forensics", Cengage Learning, 2013</li> </ol>				
4. Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education, 20	12.			
<ol> <li>MarjieT.Britz, "Computer Forensics and Cyber Crime": An Introduction". 3 ri</li> </ol>	d Edition,	Prenti	ce Hal	L 2013.
6. http://nptel.ac.in/				

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			New				0
1703MG002	PRI	NCIPLES OF MANAGEMEN	Ne	L	Т	Р	<u>C</u>
				3	0	0	3
AIM: The aim	of this course is to addre	ess broad and general guideline th	at regulates decision	making	and l	pehavi	or
within a group	n organization	general guideline in	lat regulates declara			2	
COURSE OB.							
1.	To enable the students	to study the evolution of Manage	ement				
2.	to relate, discuss, u	nderstand and present managen	nent principles, pro	cess and	1		
	procedures.						
0.	student manager or en	derstanding of the principles of	management will e	nable the	•		
UNIT 1	INTRODUCTION T	O MANAGEMENT AND ORG	ANIZATIONS			0.11	
Definition of	Management – Science	or Art – Manager Vs Entreprene	ur Types of manage			9 Ho	urs
and skins - L	volution of Managemen	t – Scientific, Human relations, S	System and continge	nev appr	nageri	ai roie	S
	FLAMMING					0.11	urs
Nature and purp	ose of planning – Plann	ing Process – Types of planning	– Objectives – Settir	ng objecti	ives –	policie	s
– Planning pren UNIT III	lises – Planning Tools	and Techniques – Decision makir	ng steps and process.				
Part and a second se	ORGANISING			•		9 Hou	irs
Line and staff a	uthority - Departmental	ormal organization – Organizatio lization – Delegation of authority	n chart – Organizat	ion struc	ture –	Types	· -
Design.	autorny Departmenta	Delegation of authority	- Centralization and	d Decent	ralızat	10n – J	ob
UNIT IV	DIRECTING					9 Hou	
Foundations of	Individual and Group b	pehaviour – Motivation – Motiva	tion theories – Moti	vational	techni	aues -	-
Job satisfaction	<ul> <li>Job enrichment – Lea</li> </ul>	adership – Types and theories of	leadership – Commu	inication	– Pro	cess of	E
communication	<ul> <li>Barrier in communica</li> </ul>	tion – Effective communication -	-Communication and	1 IT			
UNIT V	CONTROLLING	udgeter and you by taken a	1			9 Hou	rs
in Managemen	control – Productivit	udgetary and non-budgetary cont y problems and management –	rol techniques – Use	e of comp	Dim	and IT	
preventive cont	ol – Reporting	problems and management –	Control and perior	mance -	- Dire	ct and	
	1			TOTAL	: 45	Hour	·s
FURTHER RE	ADING: Decision role	s of manager, Motivational thoug	hts.				-
COURSE OUT							
	s course, students will b						
		Management and Organization. licies, tools and techniques in Plar	ning in Managaman	▲			
CO2: 3	elate the job design and	human resource management in (	Organizing	l			
CO4: 1	lustrate the skills of lea	dership and communication	e Building				
CO5: 1	terpret the controlling t	echniques in Management					
REFERENCE	NAMES AND ADDRESS OF TAXABLE PARTY.						-
1. Stepher	A. Robbins & David A	Decenzo & Mary Coulter, "Fun	damentals of Manag	ement" 7	th Ed	ition,	
Pearson	Education 2011.	and the second se				,	
2 Harold	Koontz & Heinz Weihr	ich "Essentials of management" T	ata McGraw Hill, 19	98.			
3. Robert	Kreitner & Mamata Mo	hapatra, "Management", Biztantr Daniel R Gilbert "Management", 6	a, 2008. S th Edition Pearson	Educatio	. 200	1	
4. JAF Sto	ner, Freeman K.E and I	nciples of Management", Tata Mc	Graw Hill. 1999		ii, 200	4.	1
	re & Reudy Fix, Th			office Place			]

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4. http://nptel.ac.in

1703MG003				
	L	Т	Р	С
AIM: To sensitize the Engineering students to	3	0	0	3
AIN: To sensitize the Engineering students to various aspects of Human Rights.	5	0	0	0
1. To define the term human rights and				
1. To define the term human rights and understand why it is important.         2. To sensitize the Engineering students to various aspects of Human Rights.         3. To know the historical foundations and current practice of practice				
5. To know the historical foundations of a various aspects of Human Bisla				
FOUNDATION OF HUMAN Discussion of protection l				
<ul> <li>a. To sensitize the Engineering students to various aspects of Human Rights</li> <li>b. To know the historical foundations and current practice of protecting human Rights</li> <li>FOUNDATION OF HUMAN RIGHTS</li> <li>Basis and sources of human rights – Theories of human rights</li> <li>Social Hierarchy, prejudices and explained</li> </ul>	nts			
TTU Soon and sources of human rights – Theories of hum			9 H	ours
Social Hierarchy, projudi	ations of	of hur	nan ri	ghts-
Initial Fights – Theories of human rights         Initial Social Hierarchy, prejudices and exploitation- Economic problems: poverty, illiteracy, food for the protection of the rights of disadvantaged groups.         Initial Human Rights – Theories of human rights         Initial Hierarchy, prejudices and exploitation- Economic problems: poverty, illiteracy, food for the protection of the rights of disadvantaged groups.         Initial Human Rights – Theories of human rights of SC, ST, OBC and Gender Bias, Harassment and – SC				
for the protection of the right a contract of persons- Human at poverty, illiteracy, food	Security		<u>9 H</u>	ours
UNIT III HUMAN DICUMPS	Minori	and h	abitat	ion –
Code Disc II MARGHIS OF THE WOMEN	inon	105. IV	lechar	lisms
Initial Human Rights of disadvantaged groups.         Initial Fights of SC, ST, OBC and Gender Bias, Harassment and offenses against women – Special laws and institutional mechanism women's rights- Nature and Issues in child rights in India and mechanism for the protection organized workers: Protection mechanisms.	5		0 11	
UN Convention, UNESCO Convention child rights in India and mechanism for the	hanism	for the	prote	ours
organized workers: Protection mechanisme	ection o	f the c	hild ri	ghte
Forest depletion and pollution of				
instruments-National and international activity of the complete and victims)- hazards waste and d	iscarded	techn	-9 H	ours
	- Pollut	ion co	ntrol	al
COLUMN RICHTCAND DAMAGE				
Emergence of international humanitarian law- UN charter provisions of human rights- th council and other international organization- Amnesty and red cross- International arms	IVE		<b>9</b> H	lours
council and other international organization- Amnesty and red cross- International conver forms of racial discrimination	e role o	f the I	JN see	curity
forms of racial discrimination	ition on	elimi	nation	of all
	тот	AT.	45.11	
FURTHER READING: Role of NGO, Human Rights Education: Problems and Prospects	101	AL:	45 H	ours
JORSE OUTCOMES:				
t the end of this course, students will be able to,				
CO1: Understand the principles and institutions of international human right	ghts law	, inclu	iding t	heir
origins, assumptions, contents, limits and potential		,		
CO2: Promote human rights through legal as well as non-legal means				
CO3: Understand different forms of promoting and implementing human	rights,	dome	stically	as
well as on the international level	_			
cod: Identify contextualize and use information about the human rights				
CO5: Participate in legal, political and other debates involving human rig	hts in a	know	ledgea	ble
and constructive way	A			
anu constructive my				

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170511020	HUMAN COMPUTER INTERACTION	L	ГР	С
COURSE OBJECTIVES:			0 0	3
Learn the foundation	is of line of	10		
2. Be familiar with the	is of Human Computer Interaction.			
3. Be aware of mobile l	design technologies for individuals and persons with disabilit	105		
4. Learn the guidelines	for year inter 0	103.		
INIT I PRINCIPL	ES OF HCL			Sec.
History and Foundations of I			0.1	Lours
solving: The computer: Day	HCl – Human: Human Capabilities –I/O channels – Memory rices –Memory – processing and networks: The Interaction	Passoning	91	hlam
Ergonomics - styles - elema	rices – Human: Human Capabilities –I/O channels – Memory rices –Memory – processing and networks; The Interaction nts – interactivity- Paradigms	- Keasoning	g and pro	Jolem
UNIT II THE DESI	CN pp.o. guess		namewo	JIKS -
	GN PROCESS		0.1	Laura
in the software process; con	ntals – process – scenarios – navigation – screen design – Iter ftware life cycle – usability engineering – Prototyping in a	ation and pro		
Design rules: principles stor	itais – process – scenarios – navigation – screen design – Iter ftware life cycle – usability engineering – Prototyping in p idards, guidelines, rules –Implementation Tools – Evaluation	ractice – des	ioryping	. HCI
UNIT III MODELS	adards, guidelines, rules – Implementation Tools – Evaluation	and User Sur	nort	Snale.
User models: Cognitive m	AND THEORIES odels –Socio-organizational issues and stake holder require ialog notations and design – Communication and collaboration	and ober bup		Iours
Dialogs: analysing tasks	ialog notations and design – Communication and collaboration of the second seco	ements -Tasl	Model	Tours
Computer-Supported Collar	orative W 1 Luce C	on models: G	rounwar	s and
Hypertext, Multimedia and t	borative Work Ubiquitous Computing – Virtual Reality a	and Augmen	ted Real	lity
UNIT IV MOBILE	Inc worth wide web	- inginen	ieu neu	nty –
Mobile Ecosystem: Platform	Application 6		91	Iours
Games- Mobile Information	as, Application frameworks- Types of Mobile Applications: W Architecture, Mobile 2.0 Mobile Design: Elements of Mobile	idgets, Appl	ications	iours
UNIT V WFB INT	EDEACE DESIGN	e Design, To	ols.	
Designing Web Interfaces -	- Drag & Drop Direct Cul Lin C		-91	Hours
Process Flow. Future of HC	- Drag & Drop, Direct Selection, Contextual Tools, Overlays	, Inlays and	Virtual I	Pages.
				311,
<b>COURSE OUTCOMES:</b>		TOTAL	: 45 H	lours
At the end of this course, stu	idents will be able to	-		
CO1: Design effect	ive dialog for HCI			
CO2: Design effect	ive HCl for individuals and persons with disabilities.			
COS: Assess the In	DOFIANCE Of user teedback		-	
CO4: Explain the F	ICI implications for designing multimedia/ ecommerce/ e-lear ningful user interface			
CO5: Develop mea	ningful user interface.	ning Web sit	es.	
REFERENCES:				
1. Alan Dix, Janet Fir	lay, Gregory Abowd, Russell Beale, "Human Computer Inter			
Edition, Pearson Ed	ucation, 2014.	action", 3rd		
2. Brian Fling, "Mobi	le Design and Development", First Edition, O"Reilly Media I			
2. Drail Thing, Wool	esa Neil "Designing Web Interfaces" Di La Divisi	nc., 2012.		
3. Bill Scott and Ther	esa Neil, "Designing Web Interfaces", First Edition, O"Reilly	, 2009		
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Learning in Feed forward Artificial Neural Networks, MIT Press A Bradford Book 2012 Bradford Book, 2012

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million	L	Т	Р	С
BUSINESS INTELLIGENCE	3	0	0	3
1028 BOSINESS INTELLIGENCE	3	0	U	
To learn the concepts on business intelligence and strategic plans				
to learn the concepts on business intelligence and strategic plans				
SE OBJECTIVES:				
Be exposed with the basic rudiments of business intelligence system				
understand the modeling aspects behind Business Intelligence				
understand of the business intelligence life cycle and the techniques used in it				
Be exposed with different data analysis tools and techniques				
RUSINESS INTELLIGENCE			9 H	ours
and timely decisions – Data, information and knowledge – Role of mathem	atical m	odels	– Bus	iness
a probitactures: Uvele of a business intelligence analysis – Enabling factors	s in pus	iness	intellig	gence
ets - Development of a business intelligence-system - Ethics and business intelligence	e.			
TII KNOWLEDGE DELIVERY				lours
invalligence user types Standard reports Interactive Analysis and Ad Ho	c Queryi	ng, Pa	ramete	rized
and Self-Service Reporting dimensional analysis. Alerts/Notifications, Visu	alization	: Cha	rts, GI	raphs,
tests Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, O	Consider	ations:	Optin	nizing
Presentation for the Right Message.				
RUSINESS INTELLIGENCE MODELS				Hours
kiency measures - The CCR model: Definition of target objectives- Peer group	os – Iden	ntificat	ion of	good
nating practices: cross efficiency analysis - Virtual inputs and outputs				
TIN BUSINESS INTELLIGENCE APPLICATIONS				Hours
mern matching – cluster analysis, outlier analysis - Emerging Technologies - Machi	ne Learr	ning –	BI Se	arch &
Analytics - Advanced Visualization - Rich Report				
NTAY CASE STUDY				Hours
and Analytics Instant Activation - IBM Watson Cognitive Computing - IoT and Az	ure Strea	m Ana	lytics	- <u>Coca-</u>
a Amatil: Trax Retail Execution - AgilOne Advanced Analytics	1 Deff			
	TC	DTAL	45	Hours
DURSE OUTCOMES:				
the end of this course, students will be able to,			1	
COL: Explain the fundamentals of business intelligence.				
CO2: Link data mining with business intelligence.				
constant and a modeling techniques.				
	appropr	inte ter	hniau	e
CO4: Explain the data analysis and knowledge derivery stages. CO5: Apply business intelligence methods to various situations and decide on	appropr	late tet	miqu	
LEtrain Turbun, Ramesh Sharda, Dursun Delen, "Decision Support and Busin	ess inter	ngence	e Syste	ins , 90
Childen, Petron 2015. Loring T. Mors, B. Aux, "Business Intelligence Roadmap: The Complete Project	Lifecycle	e of De	ecision	Making
Autom Wesley, 2011. A State Mining and Optimization for Decision	on Makin	g", Wi	ley Pu	blication
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The Data Warehouse Lifecycle

# HUMANITIES AND SCIENCES ELECTIVE I

AIM: The	aim of this course is to address broad and general guideline that regulates decision making is a pup or organization	0 0 3
AN ALALINE CONTRACT		and Densiarw
COURSE C	DBJECTIVES:	
	1. To enable the students to study the evolution of Management	
1	<ol> <li>To relate, discuss, understand and present management principles, process and procedures.</li> </ol>	
and state		
	<ol> <li>To knowledge and understanding of the principles of management will enable the student manager or employee</li> </ol>	
	INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS	
UNIT 1	Management - Science or Art - Manager Vs Entrepreneur To	9 Hour
Definition	of Management – Science or Art – Manager Vs Entrepreneur - Types of managers - man	
and skills -	Evolution of Management – Scientific, Human relations, System and contingency appro	aches.
UNIT II	repose of planning – Planning Process – Types of planning – Objectives – Setting objectives	9 Hour
Nature and pu	inpose of plaining – Objectives – Setting objectives	an maker
1	Planning Lools and Lechniques - Decision making stars	cs - policies
- Planning Pla	Thises Training Steps and process	es - polícies
- Planning Pla	V ORGANISING	0.0
- Planning Pro	ORGANISING Process – Formal and informal organization – Organization chart – Organization struct	9 Hour
– Planning Pro UNIT III Nature and pu Line and staff	V ORGANISING	9 Hour
Planning Plan UNIT III Vature and pu ine and staff Design.	ORGANISING inpose – Formal and informal organization – Organization chart – Organization structu authority – Departmentalization – Delegation of authority – Centralization and Decentral	9 Hour
- Plannu <del>e Pla</del> UNIT III Vature and pu ine and staff Design.	ORGANISING inpose – Formal and informal organization – Organization chart – Organization structure authority – Departmentalization – Delegation of authority – Centralization and Decentralization	9 Hour ure – Types – alization – Job
- Planning Pic UNIT III Nature and pu Line and staff Design. UNIT IV Foundations of	ORGANISING         inpose – Formal and informal organization – Organization chart – Organization structulation         authority – Departmentalization – Delegation of authority – Centralization and Decentral         DIRECTING         Individual and Group behaviour – Motivation – Motivation theories – Motivational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types and theories of leadership – Generalizational to enrichment – Leadership – Types – Generalizational to enrichment – Leadership – Generalizational to enrichment – Leadership – Types – Generalizational to enrichment – Leadership – Generalizational to enrichment – Generalizational to enrichment – Leadership – Generalizational to enrichment – Leadership – Generalizational to enrichment – Generalizational to enrichment – Generalizational to enrichment – Generalizational to enris	9 Hours
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1901MGX05	ENGINEERING ECONOMICS AND FINANCE	L	T	P	C
AIM: The nim		3	0	0	3
estimation and	of this course is to study engineering economics and finance accounting in opticing	demar	id sup	ply, co	58
COURSE	memg				
OBJECTIVES	· ·				
2. Te	enable the students to study the engineering economics and finance				
	prelate, discuss, understand and present economics and finance accounting pply, cost estimation and pricing methods	in den	nand		
UNITI	INTRODUCTION				
Managerial Ec	onomics-Relationship, with entry to the mi			9	Hours
decisions-Decis	onomics-Relationship with other disciplines-Firms: Types, objectives ion analysis.	and	goals-	Manag	erial
UNIT II	DEMAND & SUPPLY ANALYSIS				
Demand-Types	of demand-Determinants of demand D			9	Hours
Supply-Determ	of demand-Determinants of demand-Demand function-Demand elasticity-E inants of supply-Supply function-Supply elasticity	)eman	id fore	casting	
	FRODUCTION AND COST ANALYSIS			1 5	
Production fur	clion-Returns to scale-Production antimination to a scale	-		-	Hours
		ints-M	lanage	rial u	ies of
Output Decision	1-Estimation of Cost	ng ru	in cos	t curve	s-Cost
UNIT IV	PRICING			0	
Determinants o	f Price-Pricing under different objectives and different market structure	e Drie	a dina	9	Hours
Theme method.	, in plactice	S-FIIC	e uisc	riminai	1011-
UNIT V	ELEMENTARY TREATMENT			0	Hours
FINANCIAL A	CCOUNTING: Balance sheet and related concepts-Profit & Loss Statemer	it and	relate	1	
i manetar ixano	-Analysis-Cash now analysis-Funds flow analysis-Comparative financial	stater	nents-	Analys	is &
interpretation o	rinanciai statements.				
CAPITAL BUE	OGETING: Investments-Risks and return evaluation of investment decision	Aver	age ra	te of ret	urn-
Payback Period	Net Present Value-Internal rate of return.		0		
		TC	DTAL	: 45	Hours
COURSE OUT					
	s course, students will able to,				
COI: E	xplain the elements of Engineering Economics and Financial accounting m	ethod	S		
	ummarize the types, policies, tools and techniques in demand and supply				
	elate the production and cost analysis of management				
	lustrate the pricing methods in Economics and Financial accounting				
CO5: li	terpret the Elementary treatment techniques in Economics and Financial a	ccoun	nting		
REFERENCES					
I. R. Kest	wan, C.Elanchezhian and T.Sundar Selwyn, "Engineering Economics and	nd Fir	nancia	Acco	unting"
Laxmi	Publications 2011				
2. Mahesw	varan. S.N., "Management Accounting and Financial Control", Sultan Cha	ind, 20	011		
	C., Vanhorn, "Fundamentals of Financial Management" PHI, 2012				
4. Charles	T.Homgren, "Cost Accounting", PHI, 2012				

1901MGX06	HUMAN RESOURCE DEVELOPMENT IN IT	L	T	P	C
Tautmenter		3	0	0	3
AIM: The ann of th	s course is to address the need for skilled professionals who can cont	inoute ene	envery	10000	nus
Human resource dev of quality in 1T Indu	elopment and to engage the participants on contemporary issues pert	aining to th	ne ma	nagen	ient

B.TECH. Information Technology | E.G.S. Pillay Engineering College (Autonomous) Regulations 2019 | Approved in VI Academic Council Meeting held on 06.03.2021

- To learn concepts, human resource development To study the Macro and Micro perspective methods To impart knowledge on Human resource skills and development MACRO PERSPECTIVE 9 Hours HRD Concept, Origin and Need, HRD as a Total System; Approaches to HRD; Human Development and HRD; HRD at Macro and Micro Climate. MICRO PERSPECTIVE 9 Hours Areas of HRD, HRD Interventions Performance Appraisal, Potential Appraisal, Feedback and Performance UNIT II Areas of Training, Career Planning, OD or Systems Development, Rewards, Employee Welfare and Quality of Work Life and Human Resource Information; Staffing for HRD: Roles of HR Developer; Physical and Financial Resources for HRD; HR Accounting; HRD Audit, Strategic HRD INSTRUCTIONAL TECHNOLOGY 9 Hours Learning and HRD; Models and Curriculum; Principles of Learning; Group and Individual Learning; UNIT III Transactional Analysis; Assessment Centre; Behaviour Modeling and Self Directed Learning; Evaluating the HUMAN RESOURCE TRAINING AND DEVELOPMENT HRD 9 Hours Concept and Importance; Assessing Training Needs; Designing and Evaluating T&D Programmes; Role, Responsibilities and challenges to Training Managers
- TRAINING METHODS UNIT V

Training with in Industry (TWI): On the Job & Off the Job Training; Management Development: Lecture Method; Role Play; In-basket Exercise; Simulation; Vestibule Training; Management Games; Case Study; Programmed Instruction; Team Development; Sensitivity Training; Globalization challenges and Strategies of Training Program, Review on T&D Programmes in India.

# TOTAL: | 45 Hours

9 Hours

# COURSE OUTCOMES

At the end of this course, students will able to,

- COI: Understand the concepts, Human resource development
- CO2: Compare and Contrast the principles of Micro and Marco development process
- CO3: Use various instructional technology and learning methods in Human resource development
- CO4: Understand Human resource development concepts and challenges
- CO5: Compare and Correlate various training methods in HRD

# **REFERENCES:**

I. Nadler, Leonard : Corporat Human Resource Development, Van Nostrand Reinhold, ASTD, New York . 2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems, Oxford IBH Pub. Pvt.Ltd., New Delhi . 2015.

3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2014.

4. Viramani, B.R and Seth, Parmila: Evaluating Management Development, Vision Books, New Delhi .

5. Rao, T.V.(et.al): HRD in the New Economic Environment, Tata McGraw-Hill Pub.Pvt, Ltd., New Delhi, 2013.

6. Rao, T.V: HRD Audit, Sage Publications, New Delhi . 2016

7. ILO, Teaching and Training Methods for Management Development Hand Book, McGraw-Hill, New York. 8. Rao, T.V: Human Resource Development, Sage Publications, New Delhi.

901HS001	Innovation & Entrepreneurship Fundamentals	L	Т	P	С
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REREQUISITE					
The e	ourse assumes no prior skill or background in design, art or er				
	graduates and graduate students with an interest in learning de				
	ally recommended for those students planning social-venture	and of	her kin	ds of d	esign
	entions				
COURSE OBJEC	TIVES:				
	1. Cultivate the mindset and skills of successful entrepren	eurs			
	2. Lead innovative teams				
	3. Develop and refine your strategy in today's fast-changing			narkets	
	4. Grow your customer base through inbound and outbour	nd mar	keting		
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	epreneurship Basics Basics – Skills Mindset Myth vs Fact, Entrepreneur	ial Lea	adershi	<b>9 Ho</b> p: Nav	igatin
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B.Tech. Information Technology | E.G.S. Pillay Engineering College (Autonomous) Regulations 201 Approved in VI Academic Council Meeting held on 06.03.20

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COL'RSE OBJECTI	A foundation in the basic concepts of IP				
	<ol> <li>Better understanding of the relationship between IP a health, climate change, traditional knowledge and em</li> </ol>	erging te	echnolo	ogies	
	<ol><li>Practical learning experience in technology transfer a</li></ol>	nd IP lic	ense n	egotieti	0.000
	4. Experience of learning from renowned experts in a r		ense m	egonan	IONS

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COURSE	OBJECTAVES:						
	1. Understand	the terminology and conceptual of E	ntrepreneurship	5 & Sta	artup	5	
	2. Understand	t real time problem solving methodolo	ogies with tools	k .			

B.Tech. Information Technology | E.G.S. Pillay Engineering College (Autonomous) Regulations 2019 | Approved in VLA sectors 2019

Approved in VI Academic Council Meeting held on 06.03.2021 Recognize the ethical and social dilemmas and obligations of the practice of design 3.

- Diagnose common adoption barriers in individuals, groups and organizations.
- 5
- Develop a design theory from independent and qualitative research and observations 6. Participate in and lead innovation in creative and collaborative settings
- 7.

Undertake complex and unstructured problem-solving challenges in unfamiliar domains

# Entrepreneurship & Startup Basics

Module 1 5 Hours Module 1 5 Hours Entrepreneurship basics – Skill Set, Mindset, Examples, Startup basics overview, Indian Startup ntreprenetition, Problems – Identification, Selection, Evaluation, Validation, Teaming

## **Customer Discovery Process** tule II

7 Hours Thours The Discovery Process, Opportunity Identification, Evaluating Opportunities, Customer discovery a least 15 interviews. Results presentation and hypothesis refinement. Focus on customer segments of ure pusiness model canvas.

# Ideation

Module III 5 Hours Module 11 5 Ideation – Brainstorming, Technology driven Ideation, Continued customer discovery and updates to hypothesis. Focus on value proposition of business model canvas.

# Market Analysis Module IV

Mount Market Analysis – Perform market research, Competitive advantage landscape, Market Size, Go-To Market Market size, Co-10 Market Size, canvas.

# Mid-term presentation on startup idea, refined hypothesis through customer discovery Minimum Viable Product 5 Hours

Build Proof Of Concepts for specific customer use-cases. Focus on metrics of business model canvas. 7 Hours **Business Models** 

Module VI Tusiness Models/Metrics - Chosen business model for the venture, Focus on key resources/activities of ripess model canvas. Start customer validation phase. **3** Hours

# Pivoting tute VII

- Pivot product and business models based on customer discovery and validation, Choose pivot ion. Focus on cost structures and partners of business model canvas. Continued customer validation.

# Mid-term presentation on startup prototype, preliminary results from customer validation, prototype refinements and plan. 4 Hours

### IP/Legal Module VIII

IP/Legal: Importance of IP, Protect IP, Licensing IP, IP based Entrepreneurship; Examples, Continued customer validation.

## Capital Module IX

**3** Hours

6 Hours

Capital: Capital requirement for the venture, Raising capital & increments, Continued customer validation. Liquidity/Exit: Liquidity events, Trade-offs

# Final presentations of startup idea, refined prototype, customer validation, and future plans **TOTAL: 45 HOURS**

# Course Outcomes:

- 1. Detail Entrepreneurship and Startup Basics
- 2. Employ the methods and tools of Problem Solving in business context
- 3. Project Startup Idea Development Process and Methodologies through Real Problem Solving
- 1. Develop Startup Prototype through Customer Validation and Business Models
- Explain Intellectual Property Rights and its importance in business context

# KHIER READING:

- 1. The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company by Steve Blank
  - 2. Value Proposition Design: How to Create Products and Services Customers Want (Strategyzer) by Alexander Osterwalder
  - 3. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers by Alexander Osterwalder
  - 4. The Four Steps to the Epiphany, Steven Blank

1. Creative Confidence: Unleashing the Creative Potential Within Us All Book by David M. Kelley and

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B. Tech. Information Technology | E.G.S. Pillay Engineering College (Annanomenal I) publicity and Approved in VI Academic Connett Meeting held with a

1901MGX07       UNIVERSAL HUMAN VALUES AND FILLUS         AIM: the aim of this course is to give advanced understanding of the essential element of the other and professional practice of psychology, dedicated to improving standards of behavior expected by professional guidelines, content and process of value education.         1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.         2. To help students initiate a process of value education.         want to be' in their life and profession.         3. To help students understand the meaning of happiness and prosperity for a human being.         4. To facilitate the students to understand harmony at all the levels of human living, and profession and lead an ethical life.         MODULE 1       COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT       9 Hours         2. Self Exploration—what is it? - its content and process; 'Natural Acceptance' and Experiential Validation-       9 Hours         3. Continuous Happiness and Prosperity - A look at basic Human Aspirations aspirations of every human being with their correct priority;       9 Hours to fulfill the above human appirations; understanding and living in harmony at validation-         4. Might understanding Happiness and Prosperity - A critical appraisal of the current scenario       9 Hours         5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario       9 Hours         6. Method to fulfill the above human aspirations; understanding and living in harmony at various leve
<ul> <li>Affective of this course is to give advanced understanding of the essential element of the methanism for self exploration what is it? - its content and process for Value Education</li> <li>To help students initiate a process of values and skills, and understand the need, basic understand to be' in their life and process of value education. want to be' in their life and process of value education. Want to be' in their life and process of value education. Want to be' in their life and process of value education. Want to be' in their life and process of value education. Want to be' in their life and process of value education. Want to be' in their life and profession</li> <li>To help students understand the meaning of happiness and prosperity for a human being live accordingly.</li> <li>To facilitate the students to understand harmony at all the levels of human living, and profession and lead an ethical life.</li> <li>MODULE 1 COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT 9 Hours</li> <li>Self Exploration—what is it? - its content and process for Value Education</li> <li>Continuous Happiness and Prosperity - A look at basic Human Aspirations aspirations of every human being with their correct priority.</li> <li>Understanding Happiness and Prosperity correctly: A critical events for fulfillment of four standing Happiness and Prosperity correctly - A critical events.</li> </ul>
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12. Programs to ensure Sanyam and Swasthya MODULE III UNDERSTANDING HARMONY IN THE RANK
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12 Understanding harmony in the Family data
14. Understanding values in human-human relationship: meaning of Numan interaction
14. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti;
Trust (VishWas) and Kespeci (Samman) as the foundation in the
16. Understanding the meaning of Visitwas, Difference between intention and competence in relationship
17. Understanding the harmony in the society (society being an extension of fourily) of the interview of the society (society being an extension of fourily).
18. Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order
(Sarvaohauni v yawasula ) - noni rauni y to wong family
MODULE IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE 9 Hours EXISTENCE AS CO-EXISTENCE
19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in
nature
21. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence MODULE V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF 9 Hours
MODULE V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF 9 Hours HARMONY ON PROFESSIONAL ETHICS
23. Natural acceptance of human values
24 Definitiveness of Ethical Human Conduct
25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26 Competence in Professional Ethics:
a) Ability to utilize the professional competence for augmenting universal human order,

# 2. Written Test [50 marks] 50.0

	DESIGN THINKING FOR INNOVATION		L	Т	Р	С
1901115006		5				
			3	0	0	3
POUISIT		inco	ring of			
REREQUISIT	course assumes no prior skill or background in design, art, eng	lear	ning, ol	r protot esign th	yping.	It is
open	to all undergraduates and graduate students with an interest in	and	other l	cinds o	f desig	, and i
espec	ially recommended for those students planning social vertices	und	ourer	unds o		
inter	rentions					
OURSE OBJE	Understand the terminology and conceptual models used in	n des	ign dis	cipline	S	
	Onderstand how togething and learning occurs in the design		655			
2.	Recognize the ethical and social dilemmas and obligations	of th	e pract	tice of	design	
3.	Diagnose common adoption barriers in individuals, groups	and	organi	zations		
4.	Develop a design theory from independent and qualitative	recea	rch and	1 obser	vations	
5.	Develop a design theory from independent and qualitative	tives	ottings		, attents	
6.	Participate in and lead innovation in creative and collaborat	lives	·	<u>.</u>	a dame	inc
7.	Undertake complex and unstructured problem-solving chall	lenge	es in un	familia	ir doma	ins
					0.11	
lodule I Intro	duction to Design Thinking				8 Ho	urs
Iuman Centered	Design, Why Design Thinking, 5-Step Design Thinking Pr	roces	is, App	olicatio	ons, C	reativ
Confidence. The C	ulture of Innovation					
Iodule Desig	n Thinking Approach				12 Ho	ours
					- 	anati
DEO's method o	Design Thinking, Divergent Thinking & Innovation Funn	el, C	Comp	er Jour	ney M	aps to
	n Opportunities, Case Study : Turing Creative Ideas into Via	able	Compa	ames	5 Hou	rc
	ring Design Thinking ToolKit				5 1100	115
11	the Idention Experimentation Evolution					
	etation, Ideation, Experimentation, Evolution				5 Hou	rs
dodule Desig V	n Challenge Project : Phase-1				5 mou	• •
	, Project Plan, How Might We statements, Project Timeline	Pro	iect C	hecklis	st	
enne a Chanenge	Challenge Project : Phase-2	, 110	jeere		15 Ho	urs
Indula Design	Chancinge 110 jett . 1 hase-2					
	stand the Challenge, Prepare Research, Gather Inspiration.	Inte	rpretat	ion – 1	Fell Sto	ories.
viscovery – Under	stand the Challenge, Prepare Research, Gather Inspiration, g. Frame Opportunities, Ideation – Generate Ideas, Refi					
viscovery – Under earch for meanir	stand the Challenge, Prepare Research, Gather Inspiration, g, Frame Opportunities, Ideation – Generate Ideas, Refin Get Feedback, Evolution – Track Learnings, Engage Others					

B.Tech. Information Technology | II.G.S. Pillay Engineering College (Autonomous) Regulations 2019 |

# Approved in VI Academic Council Meeting held on 06.03.2021

Course Outcomes:	and the second se
A Damerling Var. Oak	

1. Describe Key Concepts and basics of Design Thinking Principles

2. Elaborate the Design Thinking Approach through Thinking Principles 5. Conduct user interviews and synthesize law ough IDEO's method & Customer Journey Maps

3. Conduct user interviews and synthesize learnings to uncover insights and identify opportunities for innovation 4. Develop Design Driven Innovative Solutions to uncover insights and identify opportunities for innovation Conduct Design Driven Innovative Solutions to RealWorld Problems

- 1. Design for Social Impact : How to by IDEO.org Design Thinking ToolKit by IDEO.org
- 3.
- The Field guide to Human Centered Design by IDEO.org

# REFERENCES:

1. Creative Confidence: Unleashing the Creative Potential Within Us All Book by David M. Kelley and Tom Kelley. 2013 2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation

3. The art of Innovation by Tom Kelly, 2011

4. Design Thinking for Strategic Innovation: What They Can't Teach You at Business Or Design School

5. The Design of Everyday Things Book by Don Norman, 1988

6. The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and 7. https://nptel.ac.in/courses/109104109/

# Assessment Procedure:-

- Quiz [3] 10 Marks Each 5%
- Class Participation 5%
- 5. Assignment [Case Study based]- 10%
- 6. Poster Presentation My Game Changer 5%
- 7. Written Test [50 marks] 20%
- 8. Design Project
  - 1. Mid Term Presentation 1 15%
  - 2. Mid Term Presentation2 15%
  - 3. Final Presentation 25%

1901HS00	07 INDIAN PATENT LAW & PATENT DRAFTING	L	Т	Р	С
PDEDEC	DUISITE:	3	0	0	3
TREAL	The course assumes no prior skill or background in design, art or en shall give an in-depth understanding of patent law to engineers and help person with a science background to understand the fundament requirements of patentability, learn how to read and interpret patent	scienti tals of	sts. Th patent	is cours law, kn	se will ow the

patent office procedures and court cases and develop the basic understanding for drafting a

patent specification, how to draft a patent application and patent searching.

**COURSE OBJECTIVES:** Understand Indian Patent Laws

- ۱. Apply the knowledge of drafting patents to draft own patent 2.
- Understand Patent searching concepts 3.
- Understand patent specifications and structure 4.
- The chance to identify areas for further IP study 5.

# Module I | Indian Patent Law

9 Hours

Introduction to the Indian Patent System Patent Laws as Concepts; Understanding the Patents Act, 1970; Understanding the Patents Rules, 2003; Preliminary Sections; Preliminary Rules; What's New in the Parents (Amendment) Rules, 2016; Easy way to read the Patents Act and Rules, Patentability of Inventors Statutory Exceptions to Patentability; Novelty and Anticipation; Inventive Step; Capable of Industrial Application; Person Skilled in the Art

# B.Tech. Information Technology | E.G.S. Pillay Engineering College (Autonomous) Regulations 20 Patent Specification Approved in VI Academic Council Meeting held on 06.03.2

Madula	Patent Specification Approved in VI Academic Council Mee	ting nera sa
Module 11		
mandalan Carr	cification Provisional and Complete Specifications; Structure of a Patent Specifications; Introduction to Patent Drafting precification—Fair basis, Enal	9 Hours
Abstract,	Description, Claime and Complete a	
Definitenes	ss, Priority: Introduced Reading Specifications: Structure of a Patent Specifications: Structure of a Patent Specifications	ecification—Til
First Inven	tor, How to Make a built to Patent Draft Specification - Fair basis, Enal	bling Disclosu
Application	AD DOLOGIA - CALLER STUCKDONES OF STUCK DOL	Apply, True ar
Module	Description, Claims, etc.; Reading a Patent Specifications; Structure of a Patent Specification; Introduction to Patent Drafting, Patent Specification—Fair basis, Enal is, Patents of Addition, Dating of Application, What to include in a Patent Application, Patent Application,	Types of Pater
111		
Prior Art,	Significance, Search Prior art, Obtaining Disclosures, Identify patental Patent Drafting	6 Hours
understand	ing invention	0
Module	Patent Drafting Disclosures, Identify, potental	le inventions
	Be sentity patental	ne mventions,
Drafting C	laims – Parts of claim, Types of claim, Examples – Apparatus or Device Claim, aim, Design Claim, Plant Claim, Software Claim. Drafting - Detailed de Patent Search	12 Hours
Process C	aim, Design Claim, Plant Claim, Examples A	12 110013
specificatio	n. Drawings, Background Abstract, Software Claim, Device Claim	s Product by
Module	aims – Parts of claim, Types of claim, Examples – Apparatus or Device Claim aim, Design Claim, Plant Claim, Software Claim. Drafting - Detailed de n. Drawings, Background, Abstract, Summary Patent Search	s, ribulet by
V		
Public sear	ch databases IPO EPO USPTO Patent s	9 Hours
public searc	h and subscribed database search. Types - 6 Subscribed databases see 1	
Analysis of	ch databases IPO EPO USPTO Patent Scope, Subscribed databases search, Different ch and subscribed database search, Types of Patent search, Patentability Search, Va Patent Search with illustration (examples from different technology areas)	nces between
	and and rent technology areas	lidity Search,
Course Out	comes:	
1. Exp	plain Indian Patent Law according to the requirement	: 45 HOURS
3. App	bly Prior Art search to identify patentability of invention	1.1
5. Use	different Patent search mechanism to understand patentability	
URTHER		
	1. Feroz Ali, The Law of Patents, LexisNexis	
	2. Konald D. Slusky, Invention Analysis and Claim in the	
	Second Edition, American Bar Association, 2012.	Guide,
(e)	3. Patent Search: Tools and Techniques, David Hunt	
and the second rest of the	4. Unfolding IPRs; Rajesh Singh, Sanjeev Kumar, Paritek Innovations, 2010	
REFERENC		
I. Ferd	z Ali, The Touchstone Effect – The Impact of Pre-grant Opposition on Patents, Le	exisNexis.
2009	).	,
A community of the second se	nt Search Work Book – Created by the course proposer	
	oduction to IPR by JP Mishra, Central Law Publications	
	://patents.google.com	

Assessment Procedure:-

- ✓ Test-1 40%
- ✓ Test-2 40%
- ✓ Assignment 20%

1901HS008		IP MANAGEMENT & COMMERCIALIZATION	L	Т	P	С
			3	0	0	3
	Intellectua	e assumes no prior skill or background in design, art or er al Property Management, focuses on intellectual property how' for participants who have already covered the bas I how first three modules, it teaches about the economic ent examples and established industry methodologies, it e	ics of 'v c signif	what' I	of IP.	Using

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	educer interesting f	
	identification, IP incubation, IP commercialization, IP valuation, and IP taxation.	In the last
	three modules it offers an in-depth look at commercial activities in the disited and	by looking
	at e-commerce and IP, digital management of creative works, and the strategic ma	inagement of
		and better of
	OBJECTIVES:	
OURSE	IP. <b>DBJECTIVES:</b> 1. Understand IP Management Concepts	
	2. Use the knowledge for IP Valuation	
	3. Understand IP Management strategies	
	4. Understand Concepts on Innovation Protection	
	5. The chance to identify areas for further IP study	
	5, The charter of the chart of	
	Intellectual Property Management	9 Hours
Module I	Intellectual Property Management Property Management: Introduction and an Overview, Economic Perspectives Anagement, Innovation and Intellectual Property Protection	on Intellectual
Intellectua	Property Management and Intellectual Property Protection	
a aperty r	Management Strategies	110415
Module	Innovation Management	
NICE	Open Innovation, Crowd Sourcing, Managing Change in Innovation	ion, Types of
Innovation	Innovation Management Strategies Strategy, Open Innovation, Crowd Sourcing, Managing Change in Innovat Building blocks of effective Innovation Management system	0.11
1.10		ing Intellectual
111	v. Value and Finance, Intellectual Property and Commercialization, On	Development -
Intellectu	al Property Value una for Intellectual Property Management, Open Source and	nent
property	al Property Value and Finance, Intellectual Property and Commercialization, On Management, Strategy for Intellectual Property Management, Open Source and IP Flexibilities and Public Domain, Case studies on Intellectual Property Manager	12 Hours
andule	II COM	acting IPRs It
IV	nalysis, 1P Audit, 1P Valuation, Financing and Raising capitals using IPRs, Pro- nent for strengthening Business, Technology Commercialization through Licensing IPR in E-Commerce & Promoting IPRs	C
Market a	nalysis, IP Audit, in Business, Technology Commercialization through Element	6 Hours
Managen	IPR in E-Commerce & Promoting IPRs	
Module	IPR in E-Commerce & Promoting IPRS         IRR in E-Commerce & Promoting IPRS         Names, Websites, Revealing Products on Internet, Using Trademarks. Promoting Advertising, Packaging         TOTA	ng – Branding
V	Websites, Revealing Products on Internet, Using Products	15 HOUR
Domain	Names, Websites, TOTA	AL: 45 HOUR
Marketin	g, Auton	
		ment
Course	Dutcomes: Surlain IP Management & Innovation Management Concepts	Jillen
1.	( ID / Commercialization ) Contavi	
2.	Apply IP Commercialization Strategies for easier Explain how to promote IPRs in Business Context ER READING: 1. Patent IPR Licensing- Technology Commercialization – Innovation M 1. Patent IPR Licensing- Technology Commercialization of Indian Innovation	arketing: Guide
3.	ER READING: ER READING:	ors
FURTH	L. Patent IPR Licensing- Technology 2017, Association of Indian Innovators, 2017, Association of Indian Innovators	
1	ER READING: 1. Patent IPR Licensing- Technology Commercialization – Innovation – Book for Researchers, Innovators, 2017, Association of Indian Innovat Book for Researchers, Innovators, 2017, Association on Patents	, LexisNexis,
DEEED	ENCES: Feroz Ali, The Touchstone Effect – The Impact of Pre-grant Opposition on Patents	
REFER	Feroz Ali, The Touchstone Effect – The ma	
1.		
2.	Feroz Aff, The Fourier 2009. Patent Search Work Book – Created by the course proposer Patent Search Work Book – Created by the course proposer	
3.	2009.         Patent Search Work Book – Created by the course property         Patent Search Work Book – Created by the course property         Introduction to IPR by JP Mishra, Central Law Publications         Introduction to IPR by JP Mishra, Central Law Publications         https://innolytics-innovation.com/innovation-management/	
4.	https://innolytics-innovation.com/innovation	
4.		

Assessment Procedure:-

✓ Test-1 - 40%

✓ Test-2 - 40%

✓ Assignment – 20%

# HSS Elective – III

	SOCIAL ENTDERDENEUROUUD	L	Т	Р	C
1901HS005	SOCIAL ENTREPRENEURSHIP		-		
		3	0	0	3
PREREQUISITE:					
The cou	rse assumes no prior skill or background in design, art or engin	eering.	It is op	en to a	all
undergr	aduates and graduate students with an interest in learning desig	n think	ing, and	is esp	ecially
recomm	ended for those students planning social-venture and other kind	ds of d	esign in	tervent	tions
COURSE OBJECT	IVES:				
	1. Shift the status quo of the world's greatest challe	enges,	fueled	by in	nspiring
	examples of social entrepreneurship in action				
	<ol> <li>Think like a social entrepreneur to tackle problems nonprofit sectors</li> </ol>	across	public	, priva	ate, and
	3. Carve your own path for making change, whether that	t be fo	unding	an ent	terprise,
	serving on a board, or supporting social entrepreneurs i	n other	creativ	e way	s
Module 1 Introd	action to Social Entrepreneurship			12 1	lours
Social Entrepreneur	ship – Introduction to Donors Choose, Samasource, Aravi	nd Eve	acare T	ransfo	rmative
change. Starting w	th a Crazy Idea, Activity : Life Map, Identify Mission -	Identi	$f_{v} = s_{v}$	ransio	roblem
Understand problen	. Understand Customer. Activity : Passion Skill Problem	- Ident	lly a so	ciai p	
Module Chang	e & Sustainability			12 1	lours
11					
Understand a theory	of change, Framework for measuring impact, Measuremen	t appro	ach, In	pact a	pproach
for your own ente	prise, Activity : Develop a theory of change: Sustainabi	ility –	Plannir	ig for	impact.
Achieving Imancia	sustainability, Building financial sustainability, Social E	Interpri	ses Re	venue	Engine,
Activity : Solutions	Map				
1 0	an Idea to Scale			5 H	ours
Reflection	Scaling impact. Tips to scale smart, Ways to scale, Act	ivity :	Build	a laun	ch plan,
	tartup Principles for Social Sector			8 H	ours
IV					
	n startup principles, Build-Measure-Learn loop, Doing Lea	n, Lear	n Princi	ples fo	or Social
	evelop your value proposition, Hypothesis Generation				
	ss Models for Social Enterprise			8 H	ours
V					
Introduction to Bu models, Innovation	siness model canvas, Integrating Impact model and busine s in social entrepreneurship model, Activity : Business mod	ss moc el canv	lel, Typ as sprig	bes of	business
					HOURS
Course Outcomes:					
1. Explain Social Er	trepreneurship Principles and solving biggest problems				
1. Explain Social Er 2. Demonstrate Solu	trepreneurship Principles and solving biggest problems tions for social problems using Change methods & Sustainabi del for an Idea to solve a social problem	lity Ma	ps		