1902BM501	BIOMEDICAL EQUIPMENT'S	L	T	P	C
		3	0	0	3
Course Objecti					
	duce the various mechanical techniques that will help failing heart.		0		
2. To study	the functioning of the unit which does the clearance of urea from the blood				
3. To Und	erstand the tests to assess the hearing loss and development of electronic dev	ices to	compe	nsate f	or
the loss.					
4. To deve	lop the various orthotics devices and prosthetic devices to overcome orthope	dic pro	blems.		
UNIT I	se electrical stimulation techniques used in clinical applications CARDIAC ASSIST DEVICES			0.17	
		1.1	1 1		ours
temporary bypas	rnal counter pulsation techniques, intra aortic balloon pump, Auxiliary ventres of left ventricle, prosthetic heart valves.	icie an	a scnen	natic ic)r
UNIT II	HEMODIALYSERS			0 H	ours
	Dialysis action, haemodialyser unit, membrane dialysis, portable dialyser m	onitor	ing and		
parameters	- 1 may be a serious and a ser	ionitor.	mg and	Tuncin	Jijai
UNIT III	HEARING AIDS			9 H	ours
Common tests -	audiograms, air conduction, bone conduction, masking techniques, SISI, Hea	aring a	ids – pr		
drawbacks in the	conventional unit, DSP based hearing aids.			•	
UNIT IV	PROSTHETIC AND ORTHODIC DEVICES			9 H	ours
Hand and arm re	placement - different types of models, externally powered limb prosthesis, for	eedbac	k in orti	hodic	
system, functiona	al electrical stimulation, sensory assist devices.				
UNIT V	RECENT TRENDS			9 H	ours
Transcutaneous e	lectrical nerve stimulator, bio-feedback.				
	Total:			45 H	ours
Further Reading	g:				
 Learn ab 	out ECG,EEG and its applications				
Course Outcome					
	mpletion of the course, the student will be able to:				
1. Explain	he functioning and usage of electromechanical units which will restore norm	nal fun	ctional	ability	of
	r organ that is defective temporarily or permanently.				
	nd what is meant by assistive technology te different forms of assistive technology and some students" experiences of using assistive technology.	den	Ploia	M o M	L/
	te different forms of assistive technology				
	nd some students" experiences of using assistive technology.	usb	rene	unsne	P
5. Discuss 1	he Importance of Recent Technologies.	1.20			
Text Books:				1	
1. John G. ' Delhi, 20	Webster, —Medical Instrumentation Application and Design 4th edition, Vi15.	Viley Ir	ndia Pvi	tLtd,N	ew
2. Joseph J. education	Carr and John M. Brown, —Introduction to Biomedical Equipment Technol 2012	logyl,	Pearsor	1	
References:	, 2012.				_
1. Levine S	N. (ed), "Advances in Bio-medical Engineering and Medical physics", Vol. publications, New York, 1968 (Unit I, IV, V).	I, II, I	V, inter		
	J, "Artificial Organs", John Wiley and sons, New York, 1976. (Unit II).				-
	Cook and Webster J.G, "Therapeutic Medical Devices", Prentice Hall Inc.,	New J	ersey,19	982 (U	nit
	der, "Rehabilitation Medicine", 3rd Edition, Jaypee Medical Publication, 20	10	_		-
	, sta Dataon, support reducal Labitedini, 20	10			

1902BM502 MEDICAL OPTICS 3 0 3 0 **Course Objectives:** To Discuss the optical properties of the tissues and the interactions of light with tissues. 2. To understand the instrumentation and components in Medical Optics. To describe the Medical Lasers and their applications To explain the optical diagnostic applications To know the emerging optical diagnostic and therapeutic techniques UNIT I **OPTICAL PROPERTIES OF THE TISSUES** 9 Hours Refraction, Scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles. **INSTRUMENTATION IN PHOTONICS** Instrumentation for absorption, scattering and emission measurements, excitation light sources - high pressure arc lamp, solid state LEDs, Lasers, optical filters, polarizer, solid state detectors, time resolved and phase resolved detectors. UNIT III APPLICATIONS OF LASERS 9 Hours Lasers in ophthalmology, Dermatology, Dentistry, Urology, Otolaryngology, Tissue welding and Soldering. **OPTICAL TOMOGRAPHY UNIT IV** 9 Hours Optical coherence tomography, Elastrography, Doppler optical coherence tomography, Application towards clinical imaging. **UNIT V** SPECIAL OPTICAL TECHNIQUES 9 Hours Near field imaging of biological structures, in vitro clinical diagnostic, fluorescent spectroscopy, photodynamic therapy. Total: 45 Hours **Further Reading:** Learn about laser Characteristics as applied to medicine and biology Non thermal diagnostic applications **Course Outcomes:** At the end of the course, the students should be able to: 1. Demonstrate knowledge of the fundamentals of optical properties of tissues - Sold development 2. Analyze the components of instrumentation in Medical Photonics and Configurations 3. Describe surgical applications of lasers. 4. Describe photonics and its diagnostic applications. - (Skill development) 5. Investigate emerging techniques in medical optics Text Books: 1. Tuan Vo Dirh, —Biomedical Photonics – Handbookl, CRC Press, Bocaraton, 2014. 2. Paras N. Prasad, —Introduction to Biophotonics, A. John Wiley and Sons, Inc. Publications, 2003 References: 1. Markolf H.Niemz, —Laser-Tissue Interaction Fundamentals and Applications, Springer, 2007 2. G.David Baxter — Therapeutic Lasers – Theory and practicel, Churchill Livingstone publications Edition-3. Leon Goldman, M.D., & R.James Rockwell, Jr., -Lasers in Medicinel, Gordon and Breach, Science

Publishers Inc., 1975.

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	MICROPROCESSOR AND ITS APPLICATIONS			1	С
1902BM5	MICROTROCESSOR AND ITS ATTEICATIONS	3	2	0	3
Course Ob	ectives:				
	1. To introduce the basic concepts of microprocessor				
	2. To explain the knowledge of Programming of 8085 processor				
	3. To educate the fundamentals of Peripheral Interfacing.				
	4. To describe about the RISC Processor, ARM Processor				
	5. To gain the basic knowledge about advanced processors				
UNIT I	MICROPROCESSOR-8085			9 H	ours
Evolution &	Importance of microprocessor, Microprocessor-8085: Functional block diagrar	n - Sign	als- M	emory	
interfacing	I/O ports and data transfer concepts - Timing Diagram - Interrupt structure, 80)86 Arc	hitectur	e	
UNIT II	PROGRAMMING OF 8085 PROCESSOR				ours
	ormat and addressing modes - Assembly language format - Data transfer, data				
	Programming: Loop structure with counting & Indexing - Look up table - Sub-	routine	instruc		
UNIT III	PERIPHERAL INTERFACING				ours
	Memory- and I/O- interfacing- Programmable Peripheral Interface (PPI)-8255:1				
	operating modes- USART: Pin diagram, block diagram, and command word				
	ntroller (PIC)-8259A: Pin diagram, block diagram, interrupt sequence, and case	ading- l	Keyboa	rd/Disp	olay
UNIT IV	279: Pin diagram, block diagram, operating modes. ARCHITECTURE OF ADVANCED PROCESSORS	1		0.11	
		i - ati au	Testas		ours
	or configurations — Intel 80286 — Internal Architectural — Register Organ rchitectural features and Register Organization of i386, i486 and Pentium process.				
UNIT V	APPLICATIONS IN MEDICINE	788018. F	AICIVI ai		ours
	e based bio signal recording, microprocessor based vision architecture for integ	rated di	agnost		
I .	roprocessor based remote health monitoring system: Concept and systems, and		_	_	mg
devices, ivii		System	ореган		,
Further Re	Total:		_	45 H	ours
	Core i3, i5 and i7				
Course Out					
	il completion of the course, the student will be able to:				
I Ani	al completion of the course, the student will be able to:				
	ly knowledge of microprocessor based systems and interfacing techniques.				
2. Ide	ly knowledge of microprocessor based systems and interfacing techniques. tify CPU and memory timing parameters.	0 0 0	H1		
2. Ide: 3. Dra	ly knowledge of microprocessor based systems and interfacing techniques. tify CPU and memory timing parameters. v a bus timing diagram for a simplex CPU-memory interface — (Employer)	abilit	ry la	Sitre	Pas
2. Ide 3. Dra 4. Ide	ly knowledge of microprocessor based systems and interfacing techniques. tify CPU and memory timing parameters.	abilit	ry 2	Sylve	Presup
2. Ide 3. Dra 4. Ide Text Books	ly knowledge of microprocessor based systems and interfacing techniques. tify CPU and memory timing parameters. w a bus timing diagram for a simplex CPU-memory interface — (Employettify the critical read and write cycle paths on a bus timing diagram.		QT.	2016	Pre
2. Ide 3. Dra 4. Ide Text Books 1. Sur	ly knowledge of microprocessor based systems and interfacing techniques. tify CPU and memory timing parameters. v a bus timing diagram for a simplex CPU-memory interface — (Employetify the critical read and write cycle paths on a bus timing diagram. l Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Leading CPU-memory interface — (Employetify the critical read and write cycle paths on a bus timing diagram.	arning F	vt. Ltd		
2. Ide 3. Dra 4. Ide Text Books 1. Sur 2. R.S	ly knowledge of microprocessor based systems and interfacing techniques. tify CPU and memory timing parameters. v a bus timing diagram for a simplex CPU-memory interface — (Employetify the critical read and write cycle paths on a bus timing diagram. l Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Le. Gaonkar, "Microprocessor Architecture Programming and Application", with	arning F	vt. Ltd		
2. Ide 3. Dra 4. Ide Text Books 1. Sur 2. R.S Nev	ly knowledge of microprocessor based systems and interfacing techniques. tify CPU and memory timing parameters. If a bus timing diagram for a simplex CPU-memory interface — (Employetify the critical read and write cycle paths on a bus timing diagram.) If Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Le. Gaonkar, "Microprocessor Architecture Programming and Application", with Delhi, 2013.	arning F 8085, W	vt. Ltd /iley Ea	astern l	Ltd.,
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ATTESTED

		1	T		
	•	L	T	P	C
1902BM50	4 BIOMEDICAL DIGITAL SIGNAL PROCESSING	3	0	0	4
Course Obj	ectives:				
	tudy about a programmable Digital signal processor.				
	earn discrete Fourier transform, properties and its computation				
	now the characteristics of IIR filter and to learn the design of	IIR filters	for filte	ering un	desired
sign					
4. To l	ntroduce the time frequency signal analysis methods				
	inderstand Data reduction techniques				
UNIT I	CLASSIFICATION OF SIGNALS AND SYSTEMS				Hours
Concept of s systems	gnals - Classification of signals - Singularity functions - Classifica	ition of sys	stems Re	presenta	tion of
UNIT II	DISCRETE FOURIER TRANSFORM AND COMPUTATION			ġ	Hours
	rier Transform- properties, magnitude and phase representation	-Computa	tion of I	DFT usi	ng FFT
	IT &DIF using radix 2 FFT – Butterfly structure.				
UNIT III	CONCEPTS OF DIGITAL FILTERING				Hours
	-Basics of signal averaging, Signal averaging as a digital filter parison of filters	FIR filter	- IIR fil	lter - Ac	laptive
UNIT IV	TIME FREQUENCY SIGNAL ANALYSIS METHODS			9	Hours
Trigonometr	c Fourier series -Fourier transform- Correlation- Convolution- Fr	equency d	lomain a	nalysis (of ECG
_	concept of wavelet - Wavelet transform- Applications of wavelet	et transform	n in bior	nedical	
instruments					
UNIT V	DATA REDUCTION TECHNIQUES		1		Hours
Data reduction	n techniques -Types of data reduction techniques -Redundancy - I	rrelevancy	removal		7.11
Further Rea	ding:			45+13	Hours
	pare the digital filters over analog filters				
	y the data reduction techniques in biomedical field.				
Course Out	· ·				$\overline{}$
	tion of the course, Student will be able to:				
	the knowledge about DSP Processors.				
	y DFT for the analysis of digital signals & systems. (S kill d	radians	ent t	molo	yabilit
	gn of IIR filters for filtering undesired signals.	1		1	and (
4. Desc	ribe the time frequency signal analysis methods(2 3 1) de	nslobu	e wit 3	employ	jability
5. Disc	ass the importance of Data reduction techniques.				
Text Books:					
1. John	G. Proakis & Dimitris G.Manolakis, —Digital Signal Processing	- Principle	es, Algor	ithms &	
	ications , Fourth Edition, Pearson Education / Prentice Hall, 2007. V.Oppenheim, S.Wilsky and S.H.Nawab, —Signals and Systems		2015		
References:					
1. Saliv 2008	ahanan S., Vallavaraj A., Gnanapriya C, Digital Signal Processing	g, Tata Mc	Graw- H	lill, New	Delhi,
	Mitra, "Digital Signal Processing – A Computer Based Approach"	, McGraw	Hill Edu	, 2013.	
	ayannRangraj M, Biomedical Signal Analysis, IEEE Press, New Y				
	okins Willis J., Biomedical Digital Signal Processing, PHI Learning			1	- >
	ianKayvan, Biomedical Signal and Image Processing, CRC Press.	•			
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1902BM505

BIO PROCESS CONTROL

T C 3

Course Objectives:

- 1. To introduce technical terms and nomenclature associated with Process control domain
- 2. To familiarize the students with characteristics, selection, sizing of control valves.
- 3. To provide an overview of the features associated with Industrial type PID controller.
- 4. To make the students understand the various PID tuning methods.
- 5. To elaborate different types of control schemes such as cascade control, feed forward control and Model Based control schemes.

PROCESS MODELLING AND DYNAMICS

9 Hours

Need for process control - Mathematical Modeling of Processes: Level, Flow, Pressure and Thermal processes -Continuous and batch processes – Self regulation – Servo and regulatory operations – Lumped and Distributed parameter models - Heat exchanger - CSTR.

UNIT II FINAL CONTROL ELEMENTS

9 Hours

Actuators: Pneumatic and electric actuators - Control Valve Terminology - Characteristic of Control Valves: Inherent and Installed characteristics - Valve Positioner - Modeling of a Pneumatically Actuated Control Valve - Control Valve Sizing: ISA S 75.01 standard flow equations for sizing Control Valves - Cavitation and flashing - Control Valve selection

UNIT III **CONTROL ACTIONS**

Characteristic of ON-OFF, Proportional, Single speed floating, Integral and Derivative controllers – P+I, P+D and P+I+D control modes - Practical forms of PID Controller - PID Implementation Issues: Bumpless, Auto/manual Mode transfer, Anti-reset windup Techniques - Direct/reverse action.

PID CONTROLLER TUNING **UNIT IV**

9 Hours

PID Controller Design Specifications: Criteria based on Time Response and Criteria based Frequency Response - PID Controller Tuning: Z-N and Cohen-Coon methods, Continuous cycling method and Damped oscillation method, optimization methods, Auto tuning - Cascade control - Feed-forward control

UNIT V MODEL BASED CONTROL SCHEMES

9 Hours

Smith Predictor Control Scheme - Internal Model Controller - IMC PID controller - Three element Boiler drum level control - Introduction to Multi-loop Control Schemes - Control Schemes for CSTR, and Heat Exchanger - P&ID diagram.

Further Reading:

Bio receptors and Bio detectors

DNA Sequencing with nano pores

Course Outcomes:

 Ability to understand technical terms and nomenclature associated with Process control domain.
 Ability to build models using first principles approach as well as analyze models.
 Ability to Design, tune and implement PID Controllers to achieve desired performance for various processes processes 4. Ability to Analyze Systems and design & implement control Schemes for various Processes.—(Skill development 5. Ability to Identify, formulate and solve problems in the Process Control Domain

Entrepreneurs

BO-1

Total: 45 Hours

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1902BM551	BIOMEDICAL DIGITAL SIGNAL PROCESSING	L	T	P	C
190261/1551	LABORATORY	0	0	4	2
Course Object	ves:				
 To mal 	te the students understand the behavior and response of the filter using diff	ferent met	hods		
2. To stud	ly the output response of the system, sampling rate conversion and FFT spe	ectrum			
To kno	w the generation of the signals and arithmetic operations using TMS320C5	X DSP P	rocesso	or.	
4. To com	pute the convolution and correlation of signals using DSP"s				
	lement the IIR filter using DSP"s				
List of Experin	nents:				
1. Genera	tion of Signals				
	ies of Discrete time Systems-Linearity, Stability, Causality & Time Variar				
3. Sampli	ng of an audio signal with different sampling rate and reconstruct the samp	oled signa	l.		
	tation of DFT of a signal using basic equation and FFT & power spectrum	estimatio	n using	DFT	
	and Simulation of IIR filters.				
	and Simulation of FIR filters				
	te signal processing-Down sampling , Up sampling , Decimation and Inter	polation			
	etic operations in DSPs				
	tion of waveforms using DSPs				
	ation of convolution and correlation between signals using DSPs				
	entation of IIR Filters using DSPs				
	entation of FIR Filters using DSPs	-			
	onal Experiments: experiments using ADSP processor				_
1. Dasic c	xperiments using ADSP processor				_
Course Outcon					
	on of the course, Student will be able to:				_
1. Design	of digital filter and Generation of various signals, Analysis of signal and sy	stem pro	perties.	-(9	14
	ation of circular and linear convolution.	den	relopn	rent	
	ne the frequency transformation and Analysis of sampling rate.			my	olo
4. Design of	of digital filters.			1	

4. Design of digital filters.

5. Analyze the power spectral density of the system.

References:

- 1. J.G. Proakis and D.G. Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, New Delhi, PHI. 2003.
- 2. S.K. Mitra, "Digital Signal Processing A Computer Based Approach", McGraw Hill Edu, 2013.
- 3. B.Venkataramani and M.Bhaskar, "Digital Signal Processors Architecture, Programming and Applications" Tata McGraw Hill Publishing Company Limited. New Delhi, 2003.

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1902RM552	BIOSENSORS AND TRANSDUCERS LAB	L	T	P	C
1902DN1552		0	0	4	2

Course Objectives:

- 1. To display and record signals using CRO.
- 2. To implement digital to analog converter.
- 3. To analyse step response of a thermometer and measure temperature using various temperature transducers.
- 4. To measure displacement using various displacement transducers.
- 5. To measure pressure using a pressure transducer.
- 6. To measure pH of a solution using pH electrodes

List of Experiments:

- 1. Study of Front panel of CRO
- 2. A to D converter
- 3. To study the dynamic behaviour of thermometer system.
- 4. To study the characteristics of a thermistor
- 5. To study thermistor linearization.
- 6. To study the characteristics of a light dependent resister.
- 7. To study the principle and working of a thermocouple
- 8. To study principle and working of LVDT
- 9. To study principle and working of a capacitive Transducer.
- 10. To study principle and working of a strain gage sensor.

Additional Experiments:

- 1. To study principle and working of a pressure sensor.
- 2. To study pH electrode.

Course Outcomes:

After completion of the course, Student will be able to:

- 1. Record and display signals using CRO.
- 2. Measure pH of a solution using pH electrodes.
- 3. Convert analog data into digital form
- Analyse step response of a thermometer and measure temperature using various temperature transducers.
- 5. Measure displacement using various displacement transducers
- 6. Measure pressure using a pressure transducer

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[Employability

REFERENCES:

- 1. Principles of applied Biomedical Instrumentation by La Geddes and L.E. Baker..
- 2. Biomedical Instrumentation and Measurement by Leslie Cromwell, Fred. J. Weibell and Pfeiffer
- 3. Principles of Biomedical Instrumentation and Measurement, Richard Aston, Merril Publishing Co., Columbus, 1990.

1904B	M553 Microprocessor and its Applications Laborator	v	L	T	P	C
		<i>y</i>	0	0	4	2
Course	e Objectives:					
1.	To Write ALP for arithmetic and logical operations in 8085					
2.	To Explain ALP for arithmetic and logical operations in 8086					
3	To Differentiate Serial and Parallel Interface					
4.	To Interface different I/Os with Microprocessors					
5.	To experiment on Arduino processor.					
	rograms using kits					
1	Basic arithmetic and Logical operations					
2.	Sorting and Searching the given data.					
	rograms using kits with MASM					
3.	B Politic operations					
	erals and Interfacing Experiments					
	Traffic light control					
5.	Stepper motor and DC Motor control					
6.	Key board and Display					
7.	Serial interface and Parallel interface					
8.	Printer Interfacing					
9.	A/D and D/A interface and Waveform Generation					
			Total:		45 Ho	urs
	onalExperiments:					
10.	Basic experiments using Arduino processor					
	Outcomes:					
After co	ompletion of the course, Student will be able to:					
1.	Write ALP Programmes for fixed and Floating Point and Arithmetic	. [.	À			
2.	Write ALP Programmes for fixed and Floating Point and Arithmetic Interface different I/Os with processor Generate waveforms using Microprocessors Explain the difference between simulator and Emulator	+ 2n	ploye	2 bili	ty 1	
5 .	Explain the difference between simulations of Explain the State of Explain the Explain t	5	ntrep	TENP.	23/0	1
	and an arranged out of a simulation and a simulation		me I		سارس	1
Referen 1.	Ramesh Gaonkar "Microprocessor Architecture, Programming, and Appli Penram International Publishing-2000.	cations w	ith the 8	085"- 5	5th edit	ion

Penram International Publishing-2000.

2. A. K. Ray & K. M. Bhurchandi, "Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing", TMH, 2002 reprint.

	LIFE SKILLS: APTITUDE - I	L	T	P	C
1904GE551		0	0	2	1

Course Objectives:

- 1. To brush up problem solving skill and to improve intellectual skill of the students
- 2. To be able to critically evaluate various real life situations by resorting to Analysis Of key issues and factors
- 3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
- 4. To enhance analytical ability of students
- 5. To augment logical and critical thinking of Student

UNIT I INTRODUCTION TO NUMBER SYSTEM, BASIC SHORTCUTS OF ADDITION, MULTIPLICATION, DIVISION

5 Hours

Classification of numbers – Types of Numbers - Divisibility rules - Finding the units digit - Finding remainders in divisions involving higher powers - LCM and HCF Models - Fractions and Digits – Square, Square roots – Cube, Cube roots – Shortcuts of addition, multiplication, Division.

UNIT II RATIO AND PROPORTION, AVERAGES

5 Hours

Definition of Ratio - Properties of Ratios - Comparison of Ratios - Problems on Ratios - Compound Ratio - Problems on Proportion, Mean proportional and Continued Proportion Definition of Average - Rules of Average - Problems on Average - Problems on Weighted Average - Finding average using assumed mean method.

UNIT III PERCENTAGES, PROFIT AND LOSS

5 Hours

Introduction Percentage - Converting a percentage into decimals - Converting a Decimal into a percentage - Percentage equivalent of fractions - Problems on percentages - Problems on Profit and Loss percentage- Relation between Cost Price and Selling price - Discount and Marked Price - Two different articles sold at same Cost Price - Two different articles sold at same Selling Price - Gain% / Loss% on Selling Price.

UNIT IV CODING AND DECODING, DIRECTION SENSE

5 Hours

Coding using same set of letters - Coding using different set of letters - Coding into a number - Problems on R-model - Solving problems by drawing the paths - Finding the net distance travelled - Finding the direction - Problems on clocks - Problems on shadows - Problems on direction sense using symbols and notations.

UNIT V NUMBER AND LETTER SERIES NUMBER AND LETTER ANALOGIES, ODD MAN OUT

5 Hours

Difference series - Product series - Squares series - Cubes series - Alternate series - Combination series - Miscellaneous series - Place values of letters - Definition of Analogy - Problems on number analogy - Problems on letter analogy - Problems on verbal analogy - Problems on number Odd man out - Problems on verbal Odd man out - Problems on verbal Odd man out

Total: 30 Hours

ASSESSMENT PATTERN:

- 1. Two tests will be conducted (25 * 2) 50 marks
- 2. Five assignments will be conducted (5*10) 50 Marks

ATTESTED

Dr. S. RAMABALAN, M.E., Ph.D., PRINCIPAL

E.G.S. Piltay Engineering College, Thethi, Nayore • 611 002. Nagapattinam (Dt) Tamil Nadu.

Course Outcomes:

After completion of the course, Student will be able to:

- 1. Learners should be able to understand number and solving problems least time
- using various shortcut Employability)
 Solve problems on averages; compare two quantities using ratio and proportion.
- Calculate concept of percentages, implement business transactions using profit workout concepts of Coding and Decoding, ability to visualize directions and
- understand the logic behind a sequence.
- 5. Learners should be able to find a series the logic behind a sequence.

References:

- 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.
- R S Agarwal, "Quantitative Aptitude for Competitive Examinations", revised edition, S.Chand publication, 2017.
- 5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.
- 6. B.S. Sijwalii and InduSijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.

1901BM601	-	Diagnostic and Therapeutic Equipment - I	L	T	P	C
Course Object	tives.		3	2	0	_ 3
Course Object		To Gather basic knowledge about measurements of parameters	relate	d to res	nirato	737
	1.	system	Totato	u to rea	piratoi	y
	2	To Learn measurement techniques of sensory responses				
	3.	To Understand different types and uses of diathermy units				
	4.	To Know ultrasound imaging technique and its use in diagnosis				_
		To discuss the importance of patient safety against electrical ha				
=		20 disease the importance of patient surely against electrical na	Zuiu			
Unit I		CARRIACEQUIRMENT			0.11	
	raph No	rmal and Abnormal Waves, Heart rate monitor, Holter Monit	on Di	****	9 H	
		nce and troubleshooting, Cardiac PacemakerInternal and Externa				
		r- Internal and External, Defibrillator Protection Circuit, Cardiac				1110
Unit II		NEUROLOGICAL EQUIPMENT	aoiaii	on can	9 H	0111
	cance of	f EEG, Multi-channel EEG recording system, Epilepsy, Evo	ked 1	Potentia		
Auditory and S	Somatose	nsory, MEG (Magneto Encephalo Graph). EEG Bio Feedback	k Insti	rument	ation.	EE
		troubleshooting.				
Unit III	MUS	SCULAR AND BIOMECHANICAL MEASUREMENTS			9 H	ou
Recording and Nerve conduction Pedobarograph	on veloci	ity measurement, EMG Bio Feedback Instrumentation. Static Measurement, Velocity, Acceleration, GAIT, Limb position	easure	ment –	Load	Cel
Nerve conduction	on veloci Dynamic	c Measurement – Velocity, Acceleration, GAIT, Limb position. RESPIRATORY MEASUREMENT SYSTEM	easure	ment –	Load 9 H	
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1902BM602		Analog and Digital Communication	L	T	P	C
			3	0	0	3
Course Objecti						
		To understand the building blocks of digital communication sy	stem.			
	2.	To understand the building blocks of Angle modulation				
	3.	To apply mathematical background for communication signal a	nalysi	S.		
	4.	To understand and analyze the signal flow in a digital and analogous	og con	nmunic	ation	
		system.				
	5.	To analyze error performance of a digital communication systematical communication systems.	m in p	resence	of no	ise
	<u> </u>	and other interferences				
Unit I		AMPLITUDE MODULATION			0.11	
	commu	nication system-Need for modulation - Amplitude modulation	2 -Sig	nale ar	9 H	our
Analysis of AM	. DSB-S	IC, SSB & VSB- Modulators and transmitters - signal-to- noise:	ratio (SNR) c	alcula	tion
for amplitude m	nodulatio	on (AM) -Receivers for continuous wave modulation - Super	hetero	odvne	Recei	vers
Digital Multiple	xers (TI	DM,FDM).	110101	, ay mo	110001	VOI
Unit II		ANGLE MODULATION			9 H	our
Basic concepts of	of freque	ency modulation .single tone frequency modulation, spectrum Ar	alysis	of sint	ısoidal	I FN
wave -Narrow b	oand FM	1 -Wide band FM, Constant Average power Transmission ban	d wid	th of F	M wa	ive
comparison of	FM and	l PM-Generation and Detection of FM and PM-Source- No	oise, F	requen	cy-do	mai
Representation of	of Noise	,Superposition of Noises, Linear Filtering of Noise.				
Unit III		tion process, Binary, M-ary systems, bits and symbols, textual			9 H	
space diagram, b	itypes, to	pase band pulse transmission, ISI and Nyquist criterion, General probability -Bit error rate(BER), Additive white Gaussian noise	ation, (AWC	Detect N) and	on, Si	gna fect
space diagram, b on BER. Unit IV	oit error	probability -Bit error rate(BER),Additive white Gaussian noise PASS BAND PULSE TRANSMISSION	(AWC	N) and	l its ef	fect our
space diagram, bon BER. Unit IV Amplitude Shift	Keying	PASS BAND PULSE TRANSMISSION (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying	ng (M	SK) and	9 H Phase	fect our Shif
space diagram, bon BER. Unit IV Amplitude Shift Keying (PSK) –	Keying BPSK -	PASS BAND PULSE TRANSMISSION (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (PSK – 8 PSK – 16 PSK - Quadrature Amplitude Modulation	ng (M	SK) –I	9 HePhase S	our Shif
space diagram, bon BER. Unit IV Amplitude Shift Keying (PSK) –	Keying BPSK -	PASS BAND PULSE TRANSMISSION (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying	ng (M	SK) –I	9 HePhase S	our Shif
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Dr. S. RAMABAZAN, M.E., Ph.D.,
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Thethi, Nagore - 611 002.
Nagapattinam (Ot) Tamil Nadit.

> Skill development | Employability

in the presence of additive white noise. 3. Convert analog signals to digital format using sampling and quantization techniques. 4. Describe and analyse the methods of transmission of digital data using baseband carrier modulation techniques. 5. Evaluate the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission of the performance level (Signal-to-Noise Ratio) of digital data transmission digital data digital da	
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3. Identify significant gap required to overcome challenges and further development in polymeric materials 4. Create combinations of materials that could be used as a tissue replacement implant. 5. Understand the testing standards applied for biomaterials. Fext books: 1. Sujata V. Bhatt, —Biomaterials!, Second Edition, Narosa Publishing House, 2005.	Further Re	ading: At the e	compatibility and tissue compatibility tests, Toxicity and special tests, Invitro and Invivo testing; Sterilisation of autoclaving. Effects of sterilization. Total: end of the course, the student should be able to Analyze different types of Biomaterials and its classification and nanotechnology towards biomaterials use.	d app	lants and	45 H	our:
4. Create combinations of materials that could be used as a tissue replacement implant. 5. Understand the testing standards applied for biomaterials. — (Still d'elopment) Fext books: 1. Sujata V. Bhatt, —Biomaterials!, Second Edition, Narosa Publishing House, 2005.	Further Re	ading: At the e	end of the course, the student should be able to Analyze different types of Biomaterials and its classification an nanotechnology towards biomaterials use. Identify significant gap required to overcome challenges and further types of Biomaterials use.	d app	lants and	45 H	our:
4. Create combinations of materials that could be used as a tissue replacement implant. 5. Understand the testing standards applied for biomaterials. — (Still disciplinate Power of the County of th	Further Re	ading: At the early 1.	d compatibility and tissue compatibility tests, Toxicity and special tests, Invitro and Invivo testing; Sterilisation of autoclaving. Effects of sterilization. Total: end of the course, the student should be able to Analyze different types of Biomaterials and its classification and nanotechnology towards biomaterials use. Identify significant gap required to overcome challenges and fur metallic and ceramic materials	d app	ly the c	45 H	ours
5. Understand the testing standards applied for biomaterials. — (Skill dislopment fext books: 1. Sujata V. Bhatt, —Biomaterials!, Second Edition, Narosa Publishing House, 2005.	Further Re	ading: At the early 1.	end of the course, the student should be able to Analyze different types of Biomaterials and its classification an anotechnology towards biomaterials use. Identify significant gap required to overcome challenges and fur metallic and ceramic materials Identify significant gap required to overcome challenges and fur metallic and ceramic materials	d app	ly the c	45 H	our t of
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1. Sujata V. Bhatt, —Biomaterialsl, Second Edition, Narosa Publishing House, 2005.	Further Re	ading: At the early 2.	end of the course, the student should be able to Analyze different types of Biomaterials and its classification annotechnology towards biomaterials use. Identify significant gap required to overcome challenges and fur metallic and ceramic materials Identify significant gap required to overcome challenges and fur metallic and ceramic materials Create combinations of materials that could be used as a tissue of the course, the student should be able to Analyze different types of Biomaterials and its classification annotechnology towards biomaterials use. Identify significant gap required to overcome challenges and fur polymeric materials Create combinations of materials that could be used as a tissue of the course, the students and instance of the course, the students and its classification and nanotechnology towards biomaterials use.	d app	ly the c	45 H	t of in
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2. Sreeram Ramakrishna, MuruganRamalingam, T. S. Sampath Kumar, and Winston O. Soboyejo,	Further Re Biopolymers Course Outcom	ading: At the earth and a series are a seri	end of the course, the student should be able to Analyze different types of Biomaterials and its classification and anotechnology towards biomaterials use. Identify significant gap required to overcome challenges and fur metallic and ceramic materials Identify significant gap required to overcome challenges and fur metallic and ceramic materials Identify significant gap required to overcome challenges and fur metallic and ceramic materials Identify significant gap required to overcome challenges and fur polymeric materials Create combinations of materials that could be used as a tissue of the course of the	d app	ly the c	45 H oncept	our t of
	Further Residence Biopolymers Course Outcom Text books: 1. Sujata V	ading: At the e 1. 2. 3. 4. 5.	end of the course, the student should be able to Analyze different types of Biomaterials and its classification an nanotechnology towards biomaterials use. Identify significant gap required to overcome challenges and fur metallic and ceramic materials Identify significant gap required to overcome challenges and fur metallic and ceramic materials Create combinations of materials that could be used as a tissue understand the testing standards applied for biomaterials. —Biomaterials, Second Edition, Narosa Publishing House, 200:	d apporther of the control of the co	ly the collevelop	45 H	ourset of

1903BM006	Bio Analytical methods and Instruments	L	T	P	C
		3	0	0	3
	(For B.E.,BME)				
Course Objectives:	The student should be made to:				
	To understand the theory and operational principles of instr	umenta	ıl meth	ods fo	or
	identification and quantitative analysis of chemical substance				
	spectroscopy.			21	
	2. To impart fundamental knowledge on gas chromatography a	ınd liqu	iid		
	chromatography.				
	3. To integrate a fundamental understanding of the underlining	princi	ples of	physi	ics as
	they relate to specific instrumentation used for gas analyzers	and p	ollutio	n	
	monitoring instruments.				
	4. To impart knowledge on the important measurement in man	y chen	iical pi	rocess	es
	and laboratories handling liquids or solutions.				
	5. To understand the working principle, types and applications	of NM	R and	Mass	
	spectroscopy.				
UNIT I	SPECTROPHOTOMETRY				Hours
Spectral method	s of analysis – Beer-Lambert law – UV-Visible spectroscopy – IR Sp	ectropi	notome	etry –	FIIR
	ry — Atomic absorption spectrophotometry — Flame emission and atomi orking principle, sources detectors and applications.	c emis	sion p	notom	etry -
UNIT II	CHROMATOGRAPHY			0.1	Hours
	es – classification – chromatographic behavior of solutes – quantitat	va dat	armin		
		ive dei			
curomatography	– Liquid chromatography – High-pressure liquid chromatography – Appl	ication		201011	- Gas
	 Liquid chromatography – High-pressure liquid chromatography – Appl INDUSTRIAL GAS ANALYZERS AND POLICITION MONIT 		s.		
UNIT III	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT	ORIN	s. G	91	Hours
UNIT III Gas analyzers –	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity determined to the conductivity of the t	ORINectors,	s. G analys	9 I	Hours
UNIT III Gas analyzers – ionization of ga	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT	ORINectors,	s. G analys	9 I	Hours
UNIT III Gas analyzers – ionization of ga	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity determined to carbon monoxide, hydrocarbons, nitrogen	orine ectors, oxides	s. G analys	9] is bas hur d	Hours ed on ioxide
UNIT III Gas analyzers – ionization of ga estimation – Dus UNIT IV Selective ion elections	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity detectors. Air pollution due to carbon monoxide, hydrocarbons, nitrogen that and smoke measurements. pH METERS AND DISSOLVED COMPONENT ANALYZIC ctrodes – Principle of pH and conductivity measurements – dissolved on	orine ectors, oxides	s. G analys , sulpi	91 is bas hur di	Hours ed or ioxide
UNIT III Gas analyzers – ionization of gastimation – Duster UNIT IV Selective ion eleganalyzer – Silicon	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity detectors. Air pollution due to carbon monoxide, hydrocarbons, nitrogen that and smoke measurements. PH METERS AND DISSOLVED COMPONENT ANALYZIC ctrodes – Principle of pH and conductivity measurements – dissolved on analyzer – Water quality Analyzer.	orine ectors, oxides ERS tygen a	s. G analys , sulpi	91 is bas hur di	Hours ed or ioxide
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Gas analyzers – ionization of ga estimation – Dus UNIT IV Selective ion ele analyzer – Silico UNIT V Basic principles	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity detection detection of the conductivity detection	ectors, oxides ERS EXYGEN 2	s. G analys , sulp	91 is bas hur di 91 er – Se 91 ry – Se	Hours ed on ioxide Hours odium
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Gas analyzers – ionization of ga estimation – Dus UNIT IV Selective ion ele analyzer – Silico UNIT V Basic principles system – Ionizati	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity determined and smoke measurements. PH METERS AND DISSOLVED COMPONENT ANALYZING ctrodes — Principle of pH and conductivity measurements — dissolved on analyzer — Water quality Analyzer. NUCLEAR MAGNETIC RESONANCE AND MASS SPECTRO— Continuous and Pulsed Fourier Transform NMR spectrometer — Mass on methods — Mass analyzers — Types of mass spectrometry. After completion of the course, Student will be able to 1. Ability to understand the fundamental principles of selective analytical instruments used in medical diagnosis, quality assurance & control and reactive analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and alternative analytical methods for quality assurance.	correctors, oxides ERS EXYGEN 2 METR S Spect Correctors, oxides	s. G analys analyze analyze Y rometr tal: studio menta	91 91 91 97 91 91 91 91 1 1 1 1 1 1 1 1	Hours dioxide Hours ample Hours ggest
Gas analyzers – ionization of ga estimation – Dus UNIT IV Selective ion ele analyzer – Silico UNIT V Basic principles system – Ionizati	INDUSTRIAL GAS ANALYZERS AND POLLUTION MONIT Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity detections and smoke measurements. PH METERS AND DISSOLVED COMPONENT ANALYZED ctrodes — Principle of pH and conductivity measurements — dissolved on analyzer — Water quality Analyzer. NUCLEAR MAGNETIC RESONANCE AND MASS SPECTRO— Continuous and Pulsed Fourier Transform NMR spectrometer — Mass on methods — Mass analyzers — Types of mass spectrometry. After completion of the course, Student will be able to 1. Ability to understand the fundamental principles of selective analytical instruments used in medical diagnosis, quality assurance & control and recompletion of the course instruments used in medical diagnosis, quality assurance & control and recompletion of the various analytical methods for quality assurance. 3. Ability to critically evaluate the strengths and limitations of the various 4. Ability to develop critical thinking for interpreting analytical data.	correctors, oxides ERS EXYGEN 2 METR S Spect Correctors, oxides	s. G analys analyze analyze Y rometr tal: studio menta	91 91 91 97 91 91 91 91 1 1 1 1 1 1 1 1	Hours dioxide Hours ample Hours ggest

1902BM651		Diag	nostic and	Therapeu	tic Equipment	Laborator	ту	L	T	P	C
Course Objec	tives:	The stud	lent should l	he made to				0	0	4	2
course objec					of different B	io potentials	3				
			fferent Bio								
			erent therape		lities.						
			e continuou								
	To Me	asure vari	ous physiolo	ogical sign	als						
List of Experi											
 Measu 	rement of	f visually 6	evoked pote	ntial							
2. Galvar	nic skin re	esistance (GSR) meası	urement							
3. Study	of shortw	ave and ul	ltrasonic dia	ithermy							
4. Measu	rement of	f various p	hysiologica	l signals us	sing bioteleme	try					
5. Study	of hemod	lialysis mo	del 6. Elect	rical safety	measurements	S					
6. Measu	rement of	f Respirato	ory paramete	ers using sp	oirometry.						
7. Study	of medica	al stimulate	or								
8. Analyz	ze the wor	rking of E	SU – cuttin	g and coag	gulation modes						
9. Record	ling of Au	udiogram									
10. Study	the worki	ng of Defi	brillator and	d pacemake	ers						
11. Analys	is of ECC	G, EEG an	d EMG sigr	nals							
12. Study	of ventila	itors									
Additional Exp	eriments:	:			,						
1. Study	of Ultrasc	ound Scani	ners								
2. Study	of heart lu	ung machi	ne model								
						Total:				45 H	our
Course Outco						"		_			
					using various r			1	0.	0	10
					ers using vario		logies			t de	
	-		trical safety		eutic technique		2	0.00	-1.16	L	^
					suitable tools.	0	yms	voy	ouu	my/	
References:	1			inaro aomig	Suitubio tools.	- En	inter	LIVA	anei	usl	uid
1. John G	. Webster New Del		cal Instrume	entation Ap	plication and I	Design _, 4th	edition	, Wi	ley Ind	ia	,
2. Joseph		nd John M	I. Brown, —	-Introduction	on to Biomedic	cal Equipme	ent Tech	nolo	gy∥, Pe	earson	
3. Leslie		l, —Biome	edical Instru	umentation	and measuren	nent , 2nd ed	dition, P	rent	ice hall	of Ind	lia,
4. Richard		-Principle	es of Biomeo	dical Instru	mentation and	Measureme	ent∥, Me	erril 1	Publish	ing	
			r —Principl	les of Appl	ied Biomedica	l Instrumen	tation 2	2004			
						rdedition,Ta				Iarri D	alhi

1902BM652		Analog and Digital Communication Laboratory	L	T	P	C
			0	0	4	2
Course Object						
		derstand the basics of analog communication.				
		dy the different modulators.				
		ow the noise performance in communication system.				
	4. To	generate AM and FM using MATLAB				
		Examine Pacemaker circuit and industrial Instrumentation Ar	nplifier			
List of Experin	nents:					
1. Generat	tion and I	Demodulation of AM.				
2. Generat	tion and I	Demodulation of FM.				
3. FM mo	dulation 1	ising PLL.				
		WM and PDM				
	f FDM aı					
		M using MATLAB.				
		using MATLAB.				
		eterodyne receiver.				
		lysis of noise in Communication system.				_
		e in AM and FM.				
Additional Exp				a :		
1. Pace Ma						
2. Industri	al Instrur	nentation amplifier				
				Total	45 H	our
Course Outcom	ies:			1000		our.
After completion	n of the c	ourse, Student will be able to				
		d FM Circuits.		1		
		d FM Circuits using MATLAB.	lily /	U	110	
3. Determi	ne the di	ferent multiplexing technique.	7/	0 20	···	
4. Design	of Super	Heterodyne receiver.	ment			
		se performance in communication system.				
References:						
1. J.G. Proakis, '	'Digital (Communications", McGraw Hill, 5 th edition, 2007				
Simon Haykir	ı, Comm	unication Systems, John Wiley, 2001.				
3.Jack Quinn, 'I	Digital Da	ta Communication", Prentice Hall; 1st edition,-199)				
		nentals of Communication System, Tata McGraw-Hill -2008.	<u> </u>			
		nalog Communication, Tata McGraw-Hill -2011				
		nciples of communication systems, Tata McGraw-Hill, 1995.				
		mmunication systems, McGraw-Hill,2002.				
		ctronic communication, PHI, 2003.				

1904GE651		LIFE SKILLS: APTITUDE - II		L	T	P	C					
				0	0	2	1					
Course Obje		# P										
	1. To brush up problem solving skill and to improve intellectual skill of the students											
		e to critically evaluate various real life situation	is by i	resort	ing to	Ana	ılysis					
		sues and factors										
	3. To be able to demonstrate various principles involved in solving mathematical											
	problems and thereby reducing the time taken for performing job functions.											
	4. To enhance analytical ability of students											
	5. To augment logical and critical thinking of Student											
TI. 'A I D A												
Unit I	Interest, Compo	xtures and Allegations, Problem on Ages, Si	mple			5 H	ours					
Introduction			and S	hore	Dr	hlan						
Introduction Partnership - Relation between capitals, Period of investments and Shares- Problems on												
mixtures - Allegation rule - Problems on Allegation - Problems on ages - Definitions Simple Interest - Problems on interest and amount - Problems when rate of interest and time period are numerically equal -												
		count in compound interest - Difference bet										
		the same principle and time period.	WCCII	Simp	10 111	icicst	and					
Unit II		Clocks, Calendars				5 H	ours					
Defining the		nong the members of a family - Solving Blood	Relati	on pu	ızzles							
the problems	on Blood Relations	s using symbols and notations - Finding the ang	le whe	en the	time	is gi	ven -					
		e is known - Relation between Angle, Minutes										
		Leap Year - Finding the number of Odd days -										
		y random calendar date.		0	,							
Unit III		ce, Time and Work				5 H	ours					
Relation between speed, distance and time - Converting kmph into m/s and vice versa - Problems on												
average speed - Problems on relative speed - Problems on trains - Problems on boats and streams -												
Problems on	circular tracks - Pr	oblems on races - Problems on Unitary method	l - Rel	lation	betw	een]	Men,					
		ms on Man-Day-Hours method - Problems on	altern	ate d	ays -	Prob	lems					
on Pipes and Cisterns.												
Unit IV		5 Hours										
Problems on tabular form - Problems on Line Graphs - Problems on Bar Graphs - Problems on Pie Charts												
- Different models in Data Sufficiency - Problems on data redundancy												
	Analytical and C			_			ours					
Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up -												
Problems on Selections - Problems on Comparisons - Finding the Implications for compound statements -												
Finding the Negations for compound statements- Problems on assumption - Problems on conclusions - Problems on inferences - Problems on strengthening and weakening of arguments.												
Problems on 1	nierences - Probler		_			20 TY						
		Total:	-			30 H	ours					
ACCECCMEN	T DATTEDNI.											
ASSESSIVIE	NT PATTERN :	will be conducted (25 * 2) 50 mode										
	 Two tests will be conducted (25 * 2) - 50 marks Five assignments will be conducted (5*10) - 50 Marks 											
	2. The assignments will be conducted (J. 10) - 30 Marks											
Course Outcomes												
Course Outcomes:												
		of the course, Student will be able to										
	1. Solve problems on Partnership, Mixture & Allegation and ages least time using											
shortcuts and apply real life situations												

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- Workout family relationships concepts, ability to visualize clocks & calendar and understand the logic behind a Sequence.
 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.

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- 1. Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills publication, 2016.
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- 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", 3rd edition, Arihant publication, 2018.
- 6. B.S. Sijwalii and InduSijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.