E.G.S.PILLAYENGINEERINGCOLLEGE

(Autonomous)

Approved byAICTE,New Delhi|Affiliated to AnnaUniversity, Chennai AccreditedbyNAAC with „A"Grade|Accredited byNBA (CSE, EEE, MECH, ECE, CIVIL, IT)

NAGAPATTINAM–611002

B.E. Civil Engineering

FullTime Curriculum and Syllabus

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA101	Engineering Mathematics – I (Matrices andCalculus)	3	1	0	4	40	60	100
1901PH101	Introduction to Mechanics	3	0	3	4	50	50	100
1901GEX01	Basic Electrical and Electronics Engineering	3	0	0	3	40	60	100
1901GEX02	Engineering Graphics	2	0	2	3	50	50	100
Laboratory Course								
1901GEX51	CAD Lab	0	0	2	1	50	50	100
1901GEX52	Basic Electrical and Electronics Engineering Lab	0	0	2	1	50	50	100
1901PHX51	Engineering Physics Lab	0	0	2	1	50	50	100
1901HS151	Communication Skills	0	0	2	1	100	0	100
		11	**1**	**13**	**18**	**430**	**370**	**800**

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1901MA101	ENGINEERING MATHEMATICS - I (MATRICES AND CALCULUS) (for Civil Engineering)	L	T	P	C
		3	2	0	4

Aim of the course: This course focuses on developing a solid understanding of the methods used in the application of differentiation, Eigen values, and Eigen vectors and using Cayley-Hamilton theorem, transformation of quadratic form into canonical form through orthogonal transformation, becoming familiar with the ideas of vector calculus, which are necessary for problems in all engineering disciplines, and developing an understanding of the common methods of complex variable theory so as to: Additionally, it helps the learner understand how transforms may be used to establish a new domain where the issue under investigation is simpler to manage.

PREREQUISITES: Basic Knowledge In Matices And Determinants, Series, Integration And Vector Calculus.

MODULE-I MATRICES

Algebra of matrices , Inverse and rank of a matrix: Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthoganal transformation and quadratic to canonical forms.

MODULE-II SEQUENCES AND SERIES

Convergence of sequence and series - Tests for convergence - Power series - Taylor's series, Series for exponential – trigonometric and logarithm functions.

MODULE-III DIFFERENTIAL CALCULUS

Curvature in Cartesian Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes and involutes

MODULE-IV INTEGRAL CALCULUS

Double integration – Cartesian and polar cordianates – Change the order of integration – Applications: Area of a curved surface using double integral – Triple integration in Cartesian co-ordiantes – Volume as triple integral

MODULE-V VECTOR CALCULUS

Gradient , Divergene and Curl – Diretioanal derivate – Irrotational and Solendial vector fields – Vector integration: Green's Theorem in a plane, Gauss divergence theorem and Stoke's theorem(excluding proofs) – Applications of the above theorems to find surface area of a closed region and volume of cube and parallelepiped.

For further reading:

nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html

COURSE OUTCOMES

After completion of the course, the student will be able to

CO1: Apply the nature of the matrix using Orthogonal Transformation & Calculate the inverse and positive powers of a square matrix

CO2: Relate the nature of series using comparison, Ratio, Leibnitz tests

CO3: Develop the evolutes and envelopes of given curves by means of radius and centre of curvature

CO4: Solve the area and volume of a curve using double and triple integration. Skill

CO5: Make use of vector concepts to estimate the area, surface and volume of planes.

TEXT / REFERENCE BOOKS:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2018.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition,2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

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1901PH101	INTRODUCTION TO MECHANICS (for Civil and Mechanical Engineering)	L	T	P	C
		3	0	0	3

Aim of the course: To make students understand and apply the knowledge in mechanics for engineering applications

PREREQUISITES:

Introduction to mechanics

Forces in Nature; Newton's laws and its completeness in describing particle motion; Solving Newton's equations of motion in polar coordinates and related problems

Vector mechanics of particles

Central forces: Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits, Application: Satellite manoeuvres

Five-term acceleration formula — Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum; Harmonic oscillator; Damped harmonic motion

Rigid body mechanics

De*finition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a* coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion;

Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples; Introduction to three-dimensional rigid body motion — (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor

Statics

Free body diagrams with examples on modelling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases.

COURSE OUTCOMES

Upon completion of this course, students will be able to

CO1: Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems

Skill

CO2: Extend all of concepts of linear kinetics to systems in general plane motion

CO3: Apply basic dynamics concepts of force, momentum, work and energy to apply in Newton's laws of motion

CO4: Apply Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces

CO5: Apply the concepts of friction and conditions of equilibrium in two and three dimensions.

REFERENCES (BOOKS):

(i) Engineering Mechanics, 2nd ed. — MK Harbola
(ii) Introduction to Mechanics — MK Verma
(iii) An Introduction to Mechanics — D Kleppner & R Kolenkow
(iv) Principles of Mechanics — JL Synge & BA Gri_*ths*
(v) Mechanics — JP Den Hartog
(vi) Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
(vii) Mechanical Vibrations — JP Den Hartog
(viii) Theory of Vibrations with Applications — WT Thomson
(ix) An Introduction to the Mechanics of Solids, 2nd ed. with SI Units — SH Crandall, NC Dahl & TJ Lardner
(x) Engineering Mechanics: Statics, 7th ed. — JL Meriam
(xi)Engineering Mechanics of Solids — EP Popov

REFERENCES (WEBSITES):

1. https://www.edx.org/course/introduction-mechanics-part-1-ricex-phys-101-1x
2. https://learn.saylor.org/course/PHYS101
3. https://www.slideshare.net/KhanSaif2/1-introduction-to-mechanics-71503843

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1901GEX01	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for all UG programmes, except BE- EEE)	L	T	P	C
		3	0	0	3

Aim of the course: To study about the fundamentals of Electrical, Electronics and Communication Engineering

PREREQUISITES:

COURSE CONTENTS

Introduction to DC and AC circuits: Ohms law - Kirchhoff's laws - Mesh analysis - Nodal analysis - Generation of AC waveforms - Analysis of R-L, R-C, R-L-C circuits - Introduction to three phase systems - Types of connections.

Electrical Machines: DC Generator, DC Motor, Transformer, Induction Motor: Working principle, construction and applications.

Measuring instruments: Classification of instruments; Voltmeter, Ammeter, Wattmeter, Energy meter, Multimeter, CRO: Principles and operation.

Semiconductor devices: V-I characteristics of PN junction diode and Zener diode; Rectifiers - Half wave and full wave rectifiers; BJT - configurations; Amplifiers & Oscillators: classification, operation and applications; SCR: Construction and V-I characteristics; Basic power converters (Block diagram approach only).

Digital systems: Boolean algebra - Reduction of Boolean expressions - De-Morgan's theorem - Logic gates - Implementation of Boolean expressions.

Communication Systems: Model of communication system - Analog and digital, Wired and wireless channel - Block diagram of various communication systems - Microwave, satellite, optical fiber and cellular mobile system.

Electrical safety and wiring: Safety measures in electrical system - Safety devices - types of wiring - Wiring accessories-staircase, fluorescent lamps and corridor wiring - Basic principles of earthing - Types of earthing - layout of generation, transmission and distribution of power (Single line diagram).

COURSE OUTCOMES

Upon completion of this course, students will be able to

1.Solve very simple problems in DC and AC circuits
2.Explain the construction and principle of operation of DC and AC machines
3.Describe the operation of simple electrical measuring instruments
4.Elucidate the characteristics of diode, Zener diode, BJT, SCR and their applications
5.Implement Boolean expressions using logic gates
6.Explain the operation of functional blocks of various communication systems
7.Summarize the electrical safety systems and electrical wiring procedures

REFERENCES (BOOKS):

1. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, PHI Learning, 2010.
2. R. Muthusubramaniam, S. Salaivahanan and K.A. Mureleedharan, "Basic Electrical Electronics and Computer Engineering", Tata McGraw Hill, 2004.
3. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI learning, New Delhi, 2004.
4. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics", S.K. Kataria and Sons, Reprint 2012 Edition.
5. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson, 11th Edition, 2013.
6. George Kennedy and Bernard Davis, "Kennedy's Electronic communication Systems", McGraw Hill Education, 5th Edition, 2011.
7. Donald P. Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", McGraw-Hill Education, 8th Edition, 2014.

REFERENCES (WEBSITES):

1. https://nptel.ac.in/courses/108108076/
2. https://nptel.ac.in/downloads/108105053/
3. https://nptel.ac.in/courses/117103063/
4. https://nptel.ac.in/courses/117102059/

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1901GEX02	ENGINEERING GRAPHICS (Common to all B.E./B.Tech. Programmes)	L	T	P	C
		2	0	2	3

MODULE I	**CONCEPTS AND CONVENTIONS (Not for Examination)**	
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.		
MODULE II	**PLANE CURVES AND FREE HAND SKETCHING**	**9 Hours**
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of Objects.		
MODULE III	**PROJECTION OF POINTS, LINES AND PLANE SURFACES**	**9 Hours**
Orthographic projection- principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.		
MODULE IV	**PROJECTION OF SOLIDS**	**9 Hours**
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.		
MODULE V	**PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**	**9 Hours**
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.		
MODULE VI	**ISOMETRIC AND PERSPECTIVE PROJECTIONS**	**9 Hours**
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.		
Stilled		**TOTAL: 45 HOURS**

COURSE OUTCOMES:

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

CO1: Perform free hand sketching of basic geometrical constructions and multiple views of objects.

CO2: Do orthographic projection of lines and plane surfaces.

CO3: Draw projections and solids and development of surfaces.

CO4: Prepare isometric and perspective sections of simple solids.

CO5: Demonstrate computer aided drafting

REFERENCES:

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore,2016.
2. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2015.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2017.
5. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2015.
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2016.

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1901GEX51 CAD (COMPUTER AIDED DRAFTING) LAB L T P C

List of Experiments: **0 0 2 1**

Basics commands of a CAD software- two-dimensional drawing, editing, layering and dimensioning - coordinate Systems-Drawing practice - orthographic views of simple solids using CAD software.

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using B-spline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
7. Drawing isometric projection of simple objects.
8. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Total: 30 Hours

References:

1. N.D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd., 2014.
2. P.S. Gill, A Textbook of Machine Drawing, Katson books, 2013.
3. R.K. Dhawan, A Textbook of Machine Drawing, S. Chand,2012.
4. K.C. John, Textbook of Machine Drawing, PHI Learning Pvt. Ltd.,2009.

Employability.

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Subject Code	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY (Common for all UG programmes)	L	T	P	C
		-	-	2	1

Aim of the course : To apply the fundamentals of Electrical and Electronics Engineering

PREREQUISITES:

1. Experiments related to verification of Ohm's law and Kirchhoff's laws
2. Experiments involving logic gates
3. Fan and light control using regulators
4. Design of 6V regulated power supply
5. Energy conservation demonstration experiment using energy meter
6. Waveform generation and calculation of rms and average values
7. IC 555 and IC 741 based experiments
8. Experiments in earthing
9. Staircase wiring and residential building wiring
10. Speed control of DC shunt motor

COURSE OUTCOMES

Upon completion of this course, students will be able to

CO1: Design and analyze electronic circuits
CO2: Test digital logic gates
CO3: Control lights and speed of motors
CO4: Measure electrical parameters using instruments
CO5: Generate waveforms
CO6: Construct different wiring schemes.

REFERENCES (BOOKS):

1. Edward Hughes, " Electrical Technology,", Pearson Education
2. D.P. Kothari and Nagrath " Basic Electronics",MH Education 2013.
3. Paul Scherz and Simon Monk "Practical Electronics for inventors" Mc Graw Hill Publications 2013.

REFERENCES (WEBSITES):

1. https://nptel.ac.in/courses/122106025/

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1901PHX51	ENGINEERING PHYSICS LAB	L	T	P	C
		0	0	2	1

List of Experiments:

1. Determination of wavelength of various colours of mercury spectrum using Laser grating
2. Determination of velocity of liquids using ultrasonic interferometer
3. Determine the dispersive power of a prism using spectrometer
4. Determine the unknown resistance of the given wire using Carey-Foster"s Bridge
5. Determine the band gap of the given semiconductor
6. Determine the acceptance angle and particle size using Laser
7. Torsional pendulum – Rigidity modulus of a steel wire
8. Thickness of a thin wire – Air Wedge
9. Measurement of Young"s modulus – Uniform and Non-uniform bending
10. Thermal conductivity –Lee"s Disc method

Skill

Total: 30 Hours

References:

1. „Practical Physics", R.K. Shukla, Anchal Srivastava, New age international (2011)
2. „B.Sc. Practical Physics", C.L Arora, S. Chand &Co. (2012)

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1901HSX51	COMMUNICATION SKILLS LAB (Common for all B.E./B.Tech. Programme)	L	T	P	C
		0	0	2	1

Course Overview: English- being the foremost global language has its domination in internationally sensitive domains such as science and technology, business and commercial relation, education and diplomatic relationships, politics and administration and so on. It is the language of corporate India, a passport for better career, better pay, and advanced knowledge and for communication with the entire world. In higher education, English is the prevalent prestigious language. Careers in any area of business communication or within the government, or in science and technology require fluency in English

The basic idea behind offering English as a practical subject at the undergraduate level is to acquaint students with a language that enjoys currency as a lingua franca of the globe. For prospective engineers nothing could be more useful or productive than being able to reach out to the world of technology. In the ELCS lab the students are trained in Communicative English Skills, phonetics, word accent, word stress, rhythm and intonation, making effective oral presentations - both extempore and Prepared- seminars, group discussions, presenting techniques of writing, role play, telephonic skills, asking and giving directions, information transfer , debates, description of person, place, objects etc; . The lab encourages students to work in a group, engage in peer-reviews and inculcate team spirit through various exercises on grammar, vocabulary, listening and pronunciation games, etc

Objectives :

1.To facilitate computer-aided multi-media instruction enabling individualized and independent language learning

2.To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.

3.To train students to use language appropriately for interviews, group discussion and public speaking

4.To help the students to cultivate the habit of reading passages from the computer monitor, thus provides them the required facility to face computer-based competitive exams such as GRE, TOEFL, GMAT etc.

5.To train them to face interviews with confidence and enable them to prepare resume with cover letter.

6.To prepare them to use communicative language and participate in public speaking.

7.To initiate them into greater use of the computer in power point presentation preparation, report Writing and e-mail writing etc.

8.To initiate them into greater use of the computer in power point presentation preparation, report Writing and e-mail writing etc.

9.To expose the Students to participate in group discussions, debates with ease.

List of Exercises :

I	**Activities on Fundamentals of Listening and Inter-personal Communication**	**6 Hours**
	Listening to conversation, listening to technical presentation- listening to online video conferencing ,interviews and webinars -starting a conversation - responding appropriately and relevantly - using appropriate body language - Role Play in different situations & Discourse Skills- using visuals.	
II	**Activities on Reading Comprehension**	**6 Hours**
	General Vs Local comprehension- reading for facts- guessing meanings from context-Scanning-skimming and inferring meaning- critical reading & effective googling- TOFEL,IELTS-reading online journals.	
III	**Activities on Writing Skills**	**6 Hours**
	Structure and presentation of different types of writing - letter writing - Resume writing- e- correspondence - Proposal writing - Technical report writing - Portfolio writing - planning for writing - improving one's writing.	
IV	**Activities on Presentation Skills**	**6 Hours**
	Oral presentations (individual and group) through JAM sessions – presentation on online platform (webinars, online meeting) - seminars -PPTs and written presentations through posters- projects-report- e-mails- assignments etc.- creative and critical thinking.	
V	**Activities on Soft Skills**	**6 Hours**

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Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation-Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conferencing and Mock Interviews-Time management-stress management –paralinguistic features-Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural communication – creative and critical.

TOTAL: 30 HOURS

Course Outcomes (COs):

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

CO1: Compose grammatically correct sentences for oral as well as written communication.
CO2: Interpret perfectly after paying attention to an audio on any theme.
CO3: Organize formal presentations effectively.
CO4: Explain the content of any written or visual material.
CO5: Generate technical and non-technical documents with appropriate contents and context.
CO6: Monitor, analyse and adjust their own communication.

REFERENCES:

1. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication: Principles and Practice", Oxford University Press, New Delhi, 2011.
2. Sudha Rani, D , "Advanced Communication Skills Laboratory Manual" , Pearson Education 2011.
3. Paul V. Anderson ,"Technical Communication",. Cengage Learning pvt. Ltd. New Delhi, 2007.
4. "English Vocabulary in Use series", Cambridge University Press 2008.
5. "Management Shapers Series" ,Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. Rizvi and Ashraf M., "Effective Technical Communication", Tata McGrawHill, New Delhi, 2005.
7. Jones, D, "The Pronunciation of English", CUP, . Cambridge,2002.

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B.E. Civil Engineering

FullTime Curriculum and Syllabus

First Year – Second Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA201	Engineering Mathematics – II (Differential equations)	3	2	0	4	40	60	100
1901CH201	Water Technology and Green Chemistry	3	0	0	3	40	60	100
1901GEX03	Programming for Problem Solving	3	0	0	3	40	60	100
1901ENX01	English for Engineers	2	0	0	2	40	60	100
1901GE201	Engineering Exploration	2	0	0	2	40	60	100
Laboratory Course								
1901CHX51	Engineering Chemistry Lab	0	0	2	1	50	50	100
1901GE253	Basic Workshop Lab	0	0	2	1	50	50	100
1901GEX52	Computer Programming Lab	0	0	2	1	50	50	100
1901HSX51	Communication Skill Lab	0	0	2	1	50	50	100
1901GE252	Engineering Intelligence - II	0	0	2	1	100	0	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1901MA201	ENGINEERING MATHEMATICS –II (Differential equations)	L	T	P	C
		3	2	0	4

Aim of the course: This course focuses on acquiring sound knowledge of techniques involved in application of differentiation, eigen values and eigen vectors and using transformation of quadratic form into canonical form through orthogonal transformation acquaint with the concepts of multiple integrals, needed for problems in all engineering disciplines, develop an understanding of the standard techniques of Linear algebra theory so as to enable the student to apply them with confidence, in application areas such as Computer Graphics, Robotic Automations, Computer Vision Problems,Simulations and also make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

PREREQUISITES: Matices and determinants, differentiation, differential equations

MODULE I : ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS

Second order linear differential equations with variable coefficients, method of variation of parameters.

MODULE II: COMPLEX VARIABLE – DIFFERENTIATION

Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; Conformal mappings, Mobius transformations

MODULE III :COMPLEX VARIABLE – INTEGRATION

Contour Integrals, Cauchy Integral formula (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

MODULE IV: SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Solution of algebraic and transcendental equations – Newton-Raphson method. Finite differences, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Lagrange's formulae. Numerical Differentiation (first two derivatives) Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 th rules (single integral)

MODULE V: SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first order Equation.Milne's and Adam's predicator-corrector methods.

For Further Reading :

https://nptel.ac.in/courses/111/105/111105134/

Skilled

COURSE OUTCOMES

After completion of this course, students can able to

CO1: Identify the solutions to second order linear homogeneous differential equations with variable coefficients.

CO2: Construct analytic functions and describe the transformation of real plane into imaginary plane using conformal mappings.

CO3: Determine complex contour integrals by using fundamental theorem, Cauchy theorem and residues.

CO4: Utilize numerical differentiation and integration whenever and wherever routine methods are not applicable.

CO5: Develop the appropriate numerical technique and interpret the results for initial values problems governed by ordinary differential equations.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3.S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4.E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5.E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6.G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.
7.J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
9.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
10.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
11.P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
12.S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

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1901CH201	WATER TECHNOLOGY AND GREEN CHEMISTRY (for *CIVIL ENGINEERING*)	L	T	P	C
		3	0	0	3

Aim of the course: Imparting knowledge on the principles of Aqua chemistry, structural polymer, light weight materials, constructional materials and metals for constructions with their applications.

PREREQUISITES: Knowledge of chemistry in higher secondary level

MODULE-I AQUA CHEMISTRY

Aqua chemistry -Chemical speciation in the environment and major pollutants in the environment (in atmosphere and aqueous system some examples mercury, cadmium, arsenic and fluoride)- Aqua chemistry -Sources, hard & soft water-sampling techniques Degree of hardness and its estimation (EDTA method)– Water Quality Parameters. boiler feed water-requirements - softening of hard water -external treatment –demineralization, Zeolite process internal treatment- desalination of sea water –reverse osmosis- Domestic water treatment –disinfection of water -Physical and chemical principles applied to water and wastewater treatment.-mixing, coagulation, sedimentation, filtration, and chemical precipitation.

MODULE-II STRUCTURAL POLYMERS

Structural Polymers- Structural Plastics and Composites- Polymer Membranes - Coatings - Adhesives, Non Weathering Materials - Flooring and Facade Materials - Glazed Brick - Photo Catalytic Cement - Acid Etched Copper and Composite Fibres (frp)

MODULE-III LIGHTWEIGHT MATERIALS

Lightweight Materials -Neoprene, Bridge pads, thermocole, Smart and Intelligent Materials – Special features –Case studies showing the applications of smart and Intelligent Materials. Petroleum products, Bituminous Materials-Fly ash –rice husk ash - properties and its application.

MODULE-IV CONSTRUCTIONAL MATERIALS

Constructional Materials- Refractories: definition, classification, properties –Manufacture of alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement– Nanotube concrete -properties and uses.

MODULE-V METALS FOR CONSTRUCTIONS

Metals For Constructions- Basic composition of mild steel, High yield deformed steel (Tor), Stainless Steel, High tensile steel and TMT steel. Corrosion and lubricant. Welding and soldering of ferrous and non-ferrous metals- Aluminium, Brass, Copper and Titanium.

COURSE OUTCOMES Employability

After completion of the course, the student will be able to

CO1: Explain the Aqua chemistry and domestic water treatment process
CO2: Descibe the polymeric materials in construction work.
CO3: Explain the Lightweight Materials and its application
wave equations.
CO4: Descibe the various types of construction materials and its properties.
CO5: Explain the role of metals for Constructions

TEXT BOOKS:

1. 1 Dara.S, Umare.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New delhi 2010.
3. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science", New Age
4. Kumar Mehta P. and Paulo J. M. Monteiro, (2014), Concrete: Microstructure, Properties and Materials, 4th Edition, McGraw-Hill, New Delhi.
5. Shetty. M. S., (2017), Concrete Technology, S. Chand and Company Ltd, New Delhi.
6. Neville. A. M, (2012), Properties of Concrete, Pearson, New Delhi.
7. ACI 211.1-91 Reapproved 2009, Standard Practice for selecting Proportions for Normal, Heavyweight, and Mass Concrete, USA

REFERENCES (WEBSITES):

1. https://www.ccdc.cam.ac.uk/solutions/csd-system/components/csd/
2. onlinelibrary.wiley.com/doi/10.1002/9780470661345.smc107/pdf

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	L	T	P	C
PROGRAMMING FOR PROBLEM SOLVING (Common for all B.E./B.Tech Programme)	3	0	0	3

1901GEX03

COURSE OBJECTIVES:

1. To prepare students to comprehend the fundamental concepts
2. To demonstrate fine grained operations in number system
3. To gain exposure in programming language using C
4. To develop programming skills using the fundamentals and basics of C Language

MODULE I INTODUCTION TO PROGRAMMING **9 Hours**

Components of Computers and its Classifications- Problem Solving Techniques – Algorithm- Flowchart– Pseudo code – Program-Compilation -Execution

MODULE II BASICS OF C PROGRAMMING **9 Hours**

Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/output statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives.

MODULE III ARRAYS AND STRINGS **9 Hours**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – Example Program: Matrix Operations - String operations

MODULE IV FUNCTIONS AND POINTERS **9 Hours**

Introduction to functions: Function prototype, function definition, function call, Built-in functions – Recursion – Example Program – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference

MODULE V STRUCTURES & FILE PROCESSING **9 Hours**

Structure - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Dynamic memory allocation -Files – Types - File processing: Sequential access, Random access -Command line arguments

TOTAL: 45 HOURS

FURTHER READING:

Object Oriented Programming Approach.

COURSE OUTCOMES: Skilled

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

CO1: Describe basic concepts of computers
CO2: Paraphrase the operations of number system
CO3: Describe about basic concepts of C-Language
CO4: Understand the code reusability with the help of user defined functions
CO5: Analyze the structure concept, union, file management and preprocessor in C language

REFERENCES:

1. Paul Deitel and Harvey Deitel, —C How to Program‖, Seventh edition, Pearson Publication
2. Juneja, B. L and Anita Seth, —Programming in C‖, CENGAGE Learning India pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C‖, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C‖, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C",McGraw-Hill Education, 1996.

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1901ENX01	ENGLISH FOR ENGINEERS (Common for all B.E./B.Tech. Programme)	L	T	P	C
		3	0	0	3

Course Overview :

The course "English for Engineers" aims at honing the basic language skills of the learners. The course is a combination of introducing the rudiments of grammar and application of the principles in both verbal and written expressions. Students are trained to read and comprehend technical texts in the field of engineering. They are guided to acquire vocabulary building and write efficiently in technical writing .The course has been deftly planed and the learners are guided to use the LSRW skills for acquiring their technical knowhow and exhibiting their technical achievement by verbal and written mode .Students are encouraged to use English as a tool to get technical knowledge and display their attainment

Objective:

1.To teach the students to interpret grammatically correct sentences for oral as well as written communication.
2.To make the learners to identify perfectly after paying attention to an audio on any theme.
3.To expose the students to demonstrate formal presentations effectively.
4.To cultivate learners to explain the content of any written or visual material.
5.To help the learners to get trained in describing technical and non-technical documents with appropriate contents and context.
6.To motivate the students to classify, analyse and adjust their own communication.

MODULE I	FOCUS ON LANGUAGE (Vocabulary and Grammar)	9 Hours

Vocabulary -The Concept of Word Formation - Prefixes- Suffixes- Synonyms – Antonyms - Grammar -Articles- Preposition- Adjective-Adverb-Connectives -Tenses (present, past & future) - Conditional Clauses -Active voice –passive voice and Impersonal passive voice - Wh- Questions

MODULE II	LISTENING SKILLS	9 Hours

Listening-Types of Listening -listening to short or longer texts- listening and Note taking- -formal and informal conversations- telephonic etiquettes- narratives from different sources. - Correlative verbal and nonverbal communication - listening to panel members (how to response to panel members after listening panel members) – listening to facing online interviews (or) interviews on video conferencing mode - listening webinars.

MODULE III	SPEAKING SKILL	9 Hours

Speaking - Stress and intonation –Communication skills- Role of ICT in Communication, -Process of communication- oral presentation skills- verbal and non verbal communication-individual and group presentations- impromptu presentation- public speaking- Group discussion- speaking to the panel members (online interviews , video conferencing, online meeting and webinars.

MODULE IV	READING SKILLS	9 Hours

Reading– Intensive Reading –Predicting the content -Comprehending general and technical articles -Cloze reading - Inductive reading- Short narrative and descriptions from newspapers – Skimming and scanning-reading and interpretation-critical reading interpreting and transferring graphical information- sequencing of sentences-analytical reading on various Projects.

MODULE V	WRITING SKILLS	9 Hours

Writing- Precise writing –Summarizing- Interpreting visual texts (pie chart, bar chart, picture, advertisements etc., - Proposal writing (launching new units or department in a institution or industry & to get loan from bank) -Report writing (accident, progress, project, survey, Industrial visit)- job application-e- mail drafting- letter writing (permission, accepting and decaling)- e.mail drafting instructions –recommendations –checklist- uses of Print and electronic media (internet, fax, mobile, interactive video and teleconferencing, computer) e-governance.

TOTAL: 45 HOURS

Course Outcomes (COs): After successful completion of the course, students will be able to

Skilled

CO1: Interpret grammatically correct sentences for oral as well as written communication.
CO2: Identify perfectly after paying attention to an audio on any theme.
CO3: Demonstrate formal presentations effectively.
CO4: Explain the content of any written or visual material.
CO5: Describe technical and non-technical documents with appropriate contents and context.
CO6: Classify, analyse and adjust their own communication.

REFERENCES:

1. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication: Principles and Practice", Oxford University Press, New Delhi, 2011.
2. Rizvi and Ashraf M., "Effective Technical Communication", Tata McGraw-Hill, New Delhi, 2005.
3. G. Radhakrishna Pillai, "English for Success", Central Institute of English and Foreign Languages", Emerald Publishers ,Hyderabad, 2003
4. Jones. D, "The Pronunciation of English", CUP, Cambridge, 2002.

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1901GE201	ENGINEERING EXPLORATION	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating ill-defined problems.
- Undergo several design challenges and work towards the final design challenge
- Apply Design Thinking on the following Streams to Project Stream 1: Electronics, Robotics, IOT and Sensors Project Stream 2: Computer Science and IT Applications Project Stream 3: Mechanical and Electrical tools

Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?

- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with Design Challenge and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

Skilled

TASKS TO BE DONE:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems through this
- Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback

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- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card Task 8:
- Final Report Submission and Presentation

- Method of Evaluation: Same as Mini project category. Project exhibition may be conducted.

REFERENCES:

1. Tom Kelly, The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm (Profile Books, 2002)
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:

1. Human-Centered Design Toolkit (IDEO); https://www.ideo.com/post/design-kit
2. Design Thinking Boot Camp Bootleg(Stanford D-School); https://dschool.stanford.edu/resources/the-bootcamp-bootleg
3. Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf
4. Design Thinking for Educators (IDEO); https://designthinkingforeducators.com/

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1901CHX51	ENGINEERING CHEMISTRY LAB	L	T	P	C
		0	0	2	1

Aim of the course: Engineering Chemistry laboratory course is designed to provide basic chemistry and its application to the first year engineering students. The course includes the study of applications of water quality chemistry, identification of acidic and alkaline nature of water,molecular weight determination and explaining the principles behind each experiments.

List of Practical Experiments

1. Determination of total, temporary & permanent hardness of water by EDTA method
2. Determination of strength of given hydrochloric acid using pH meter
3. Estimation of iron content of the given solution using potentiometer
4. Estimation of sodium present in water using flame photometer
5. Corrosion experiment – weight loss method
6. Determination of molecular weight of a polymer by viscometry method
7. Conductometric titration of strong acid Vs strong Base
8. Estimation of dissolved oxygen in a water sample/sewage by Winklers method.
9. Comparison of alkalinities of the given water samples
10. Determination of concentration of unknown colored solution using spectrophotometer
11. Determination of percentage of copper in alloy
12. Determination of ferrous iron in cement by Spectrophotometry method
13. Adsorption of acetic acid on charcoal
14. Determination the flash point and fire point of a given oil using Pensky martine closed cup apparatus
15. Determination the calorific value of solid fuels
16. Determination the structural of the compound using chemo software.

COURSE OUTCOMES Employability

After completion of the course, the student will be able to

CO1: Measure the hardness and alkalinity of given water sample

CO2: Find the amount and percentage of iron in unknown sample using EMF and photometric methods

CO3: Determine the amount of strong acid present in the given sample using PH metric and conductometric methods

CO4: Determine the amount of dissolved oxygen and heavy metal present in the given sample

CO5: Determine the molecular weight of the given polymer

TEXT BOOKS:

1. Experimental organic chemistry, Daniel R. Palleros, John Wiley & Sons, Inc., New Yor (2001)
2. "Engineering Chemistry", Jain & Jain, 15th edition, Dhanpat Rai Publishing company, New Delhi.
3. Vogel"s Textbook of practical organic chemistry, Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R LBS Singapore (1994).
4. LBS Singapore (1994). Kolthoff I.M., Sandell E.B. et al Mcmillan, Madras 1980.

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1901GE253	BASIC WORKSHOP AND MANUFACTURING PRACTICES LAB (Common to Civil, EEE and MECH.)	L	T	P	C
		0	0	2	1

List of Experiments Skilled

1. Forming of simple object in sheet metal using suitable tools.(Example: Dust Pan, Rectangular tray and Cone making)
2. Prepare V (or) Half round (or) Square (or) Dovetail joint from the given mild Steel flat.
3. Fabrication of a simple component using thin and thick plates using arc welding.

   (Example: Butt , Lap and T - Joints)
4. Making a simple component using carpentry power tools.(Example: Cross Lap, T-Lap and Dove tail joints)
5. Construct a household pipe line connections using pipes, Tee joint, four way joint, elbow, union, bend, Gate valve and Taps.

TOTAL: 30 Hours

REFERENCES: Lab manual

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1901GEX52	COMPUTER PROGRAMMING LAB	L T P C 0 0 2 1

(Common for all B.E./B.Tech. Programme)

List of Experiments:

1. Working with word and style sheets
2. Write a C program to implement basic concepts
3. Write a C program to implement Decision Making and Branching statements
4. Write a C program to implement looping statements
5. Write a C program to implement Arrays
6. Write a C program to implement Strings
7. Write a C program to implement pointers
8. Write a C program to implement Structures
9. Write a C program to work with files in C

Skilled

Total: 45 Hours

References:

1. Paul Deitel and Harvey Deitel, —C How to Program‖, Seventh edition, Pearson Publication
2. Juneja, B. L and Anita Seth, —Programming in C‖, CENGAGE Learning India pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C‖, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C‖, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C",McGraw- Hill Education, 1996.

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1901HSX51	COMMUNICATION SKILLS LAB	L T P C 0 0 2 1

(Common for all B.E./B.Tech. Programme)

Course Overview:

English- being the foremost global language has its domination in internationally sensitive domains such as science and technology, business and commercial relation, education and diplomatic relationships, politics and administration and so on. It is the language of corporate India, a passport for better career, better pay, and advanced knowledge and for communication with the entire world. In higher education, English is the prevalent prestigious language. Careers in any area of business communication or within the government, or in science and technology require fluency in English The basic idea behind offering English as a practical subject at the undergraduate level is to acquaint students with a language that enjoys currency as a lingua franca of the globe. For prospective engineers nothing could be more useful or productive than being able to reach out to the world of technology. In the ELCS lab the students are trained in Communicative English Skills, phonetics, word accent, word stress, rhythm and intonation, making effective oral presentations - both extempore and Prepared- seminars, group discussions, presenting techniques of writing, role play, telephonic skills, asking and giving directions, information transfer , debates, description of person, place, objects etc; . The lab encourages students to work in a group, engage in peer-reviews and inculcate team spirit through various exercises on grammar, vocabulary, listening and pronunciation games, etc

Objectives :

- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.
- To train students to use language appropriately for interviews, group discussion and public speaking
- To help the students to cultivate the habit of reading passages from the computer monitor, thus provides them the required facility to face computer-based competitive exams such as GRE, TOEFL, GMAT etc.
- To train them to face interviews with confidence and enable them to prepare resume with cover letter.
- To prepare them to use communicative language and participate in public speaking.
- To initiate them into greater use of the computer in power point presentation preparation, report Writing and e-mail writing etc.
- To initiate them into greater use of the computer in power point presentation preparation, report Writing and e-mail writing etc.
- To expose the Students to participate in group discussions, debates with ease.

List of Exercises :

I Activities on Fundamentals of Listening and Inter-personal Communication 6 Hours

Listening to conversation, listening to technical presentation- listening to online video conferencing ,interviews and webinars -starting a conversation - responding appropriately and relevantly - using appropriate body language - Role Play in different situations & Discourse

II Activities on Reading Comprehension 6 Hours

General Vs Local comprehension- reading for facts- guessing meanings from context-Scanning-skimming and inferring meaning- critical reading & effective googling- TOFEL,IELTS-reading online journals.

III Activities on Writing Skills 6 Hours

Structure and presentation of different types of writing - letter writing - Resume writing- e- correspondence - Proposal writing - Technical report writing - Portfolio writing - planning for writing - improving one's writing

IV Activities on Presentation Skills 6 Hours

Oral presentations (individual and group) through JAM sessions – presentation on online platform (webinars, online meeting) - seminars -PPTs and written presentations through posters- projects- report- e-mails- assignments etc.- creative and critical thinking.

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V Activities on Soft Skills **6 Hours**

Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation-Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conferencing and Mock Interviews-Time management-stress management –paralinguistic features- Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural communication – creative and critical.

TOTAL: 30 HOURS

Course Outcomes (COs):

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

CO1: Compose grammatically correct sentences for oral as well as written communication.

CO2: Interpret perfectly after paying attention to an audio on any theme.

CO3: Organize formal presentations effectively.

CO4: Explain the content of any written or visual material.

CO5: Generate technical and non-technical documents with appropriate contents and context. CO6: Monitor, analyse and adjust their own communication.

REFERENCES:

1. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication: Principles and Practice", Oxford University Press, New Delhi, 2011.
2. Sudha Rani, D , "Advanced Communication Skills Laboratory Manual" , Pearson Education 2011.
3. Paul V. Anderson ,"Technical Communication",. Cengage Learning pvt. Ltd. New Delhi, 2007.
4. "English Vocabulary in Use series", Cambridge University Press 2008.
5. "Management Shapers Series" ,Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. Rizvi and Ashraf M., "Effective Technical Communication", Tata McGrawHill, New Delhi, 2005.
7. Jones, D, "The Pronunciation of English", CUP, . Cambridge,2002.

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1901GE252 ENGINEERING INTELLIGENCE II **L T P C**
0 0 2 1

Prerequisite: Engineering Intelligence - I

MODULE I VOCABULARY BULIDING **6 Hours**
Parts of Grammar- SVA- Art of Writing- word building activities

MODULEII COMMUNICATION WORKSHOP **6 Hours**
Story Telling- Newspaper Reading-Extempore.

MODULEIII INTERPERSONAL SKILLS **6 Hours**
Personality Development - Creativity and innovation –Critical Thinking and Problem Solving – Work Ethics-Technical Skill Vs Interpersonal Skills

MODULEIV LEADERSHIP& EMPLOYABILITY SKILLS **6 Hours**
Levels of Leadership-Making of leader-Types of leadership-Transactions Vs Transformational Leadership – Exercises - Industry Expectations & Career Opportunities- Recruitment patterns.

MODULE V RESUME BUILDING **6 Hours**
Importance of Resume- Resume Preparation - introducing onself

TOTAL: 30 HOURS

Course Outcomes:
On the successful completion of the course, students will be able to
CO1: Understand various vocabulary building activites
CO2: Use various communication skill workshop for reading and writing.
CO3: Apply interpersonal skill to motivate creating and innovating skills
CO4: Apply various leadership and employability skill to get career opportunities
CO5: Prepare resume with necessary components

REFERENCES:
1. Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxfor Publishers.
2. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition , 2007.
3. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017.

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NAGAPATTINAM – 611 002

B.E. Civil Engineering

Full Time Curriculum and Syllabus

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MA301	Engineering Mathematics III	3	2	0	4	40	60	100
1702CE301	Engineering Surveying I	3	0	0	3	40	60	100
1702CE302	Solid Mechanics I	3	0	0	3	40	60	100
1702CE303	Fluid Mechanics	3	0	0	3	40	60	100
1702CE304	Engineering Geology	3	0	0	3	40	60	100
1702CE305	Building Materials & Resource Planning	3	0	0	3	40	60	100
Laboratory Course								
1702CE351	Surveying Lab I	0	0	4	2	50	50	100
1702CE352	Strength Of Materials Lab	0	0	2	1	50	50	100
1704CE353	Technical Seminar I	0	0	2	1	50	50	100
1704GE351	Life Skills: Soft Skills	0	0	2	0	100	0	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701MA301	ENGINEERING MATHEMATICS III (Common to B.E - Civil, CSE, EEE, Mech B.Tech- IT Degree Programmes)	L	T	P	C
		3	2	0	4

PREREQUISITE :

1. Engineering Mathematics I
2. Engineering Mathematics II

COURSE OBJECTIVES:

1. To introduce Fourier series analysis and applications in Engineering, apart from its use in solving boundary value problems.
2. To acquaint the student with Fourier transform techniques used in wide variety of situations.
3. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I FOURIER SERIES **12 Hours**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic analysis – Simple Applications

UNIT II FOURIER TRANSFORMS **12 Hours**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity

UNIT III PARTIAL DIFFERENTIAL EQUATIONS **12 Hours**

Formation of partial differential equations – Singular integrals — Solutions of standard types of first order partial differential equations – Lagrange's linear equation — Linear partial differential equations of second order with constant coefficients of homogeneous type- Applications

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **12 Hours**

Classification of PDE – Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT V Z – TRANSFORMS AND DIFFERENCE EQUATIONS **12 Hours**

Z - transforms – Elementary properties – Inverse Z – transform (using partial fraction and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z – transform.

TOTAL: 60 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Linear Algebra
2. Numerical Solution of non-homogeneous partial differential equations

COURSE OUTCOMES:

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

CO1 Use Fourier series analysis which is central to many applications in engineering
CO2 Apply Fourier transform techniques used in wide variety of situations
CO3 Compute the solution of partial differential equations
CO4 Solve boundary value problem using partial differential equation
CO5 Apply Z transform techniques for discrete time systems

REFERENCES:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012
2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
3. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd , 2007
4. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company Limited, New Delhi, 2008.
5. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.
6. www.nptelvideos.in/2012/11/mathematics-iii.html

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1702CE301	ENGINEERING SURVEYING I	L	T	P	C
		3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering.

COURSE OBJECTIVES:

To introduce the principles of various surveying methods and applications to Civil Engineering projects.

UNIT I INTRODUCTION TO CHAIN SURVEYING **9 Hours**

Definition – Objectives and uses of surveying – Chain Surveying – Instrument used for chaining – Chains and tape types – Definition of terms commonly used in chain surveying : survey stations, Base line , check line and tie line – Ranging : Direct and indirect ranging – Chain surveying : Equipments required , field work and recording field work and recording field notes – Errors in Chaining – Obstacles in Chaining : Types and problems – Tape Correction : Simple Problem.

UNIT II COMPASS SURVEYING **9 Hours**

Angular measurements – Necessity – Instruments used – Prismatic compass : Construction details functions and Temporary adjustment – Types of meridians – Types of bearings : whole circle and reduced bearings, Fore and Back Bearings – Computation of bearings form included angles – Problems – Local Attraction : Detection, correction and problems – Dip and declination – Compass traversing – Errors in compass surveying.

UNIT III LEVELING **9 Hours**

Leveling – Definition – Level – Parts – Functions – Accessories – Types of levels : Dumpy level, Modern Tilting level, Quick setting level, Automatic and laser level – Leveling staff – Types – component parts of Leveling instruments – Definitions of terms used : Level surface, Horizontal and vertical surfaces, Datum Bench marks, Reduced level, Rise, Fall, Line of Collimation, Axis of telescope, Axis of Bubble tube, Station Back site, Fore site, Intermediate site, Change point, Height of instruments – Reduction of levels – Height of collimation and Rise and Fall Method – Missing entry calculation : Problems.

UNIT IV CONDITION LEVELING **9 Hours**

Types of Leveling – Check Leveling : Definition, Field Procedure and use – Profile leveling or Longitudinal section(L.S) : Definition, uses, field procedure and plotting the profile – Cross section leveling(C.S) : Definition , Uses, Field procedure and plotting the Cross-section – Specimen Field book for L.S and C.S – Reciprocal leveling : Definition, Uses, and problems on difference in elevation – Curvature and Refraction : Effects, Correction and problems .

UNIT V CONTOUR SURVEYING **9 Hours**

Definition – Contour – Contouring – Characteristics of contours – Methods of contouring – Direct and indirect methods – Tacheometric contouring – Interpolation of contours – Different methods – Contouring gradient – Used of contour plan and map – Calculation of capacity of reservoir: Simple problems.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Advanced Surveying Instruments
2. Easy to measure the critical location areas

COURSE OUTCOMES:

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

CO1 Appreciate the need for accurate and through note taking in field work to serve as a legal record.

CO2 Gain a basic understanding of the principles and operation of the global position system

CO3 Gain the ability to measure difference in elevation, draw and utilize contour plots and calculate volumes for earthwork.

CO4 Improve ability to function as a survey party in completing the assigned field work.

CO5 Appreciate the need for licensed surveyors to establish positioning information for property and structures.

REFERENCES:

1. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Ha of India, 2004
2. AroraK.R.,"SurveyingVol 1 & 2", Standard Book House, 10th Edition 2008
3. Alfred Leick, "GPS satellite surveying", JohnWiley& Sons Inc., 3rd Edition, 2004.
4. GuochengXu, " GPS Theory, Algorithms and Applications", Springer - Berlin, 2003.

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1702CE302	SOLID MECHANICS - I	L	T	P	C
		3	2	0	4

PREREQUISITE :

1. Basic Civil and Mechanical Engineering
2. Engineering Mechanics

COURSE OBJECTIVES:

1. To impart knowledge on fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.
2. To acquire the ability to analyze the mechanism of load transfer in beams, the induced stress resultants and deformations.
3. To develop the clear understanding of the effect of torsion on shafts and springs.

UNIT I STRESS AND STRAIN **12 Hours**

Stress and strain at a point – Tension, Compression, Shear Stress – Hooke's Law – Relationship among elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses – Thin Cylinders and Shells – Strain Energy due to Axial Force – Resilience – Stresses due to impact and Suddenly Applied Load – Compound Bars.

UNIT II SHEAR AND BENDING IN BEAMS **12 Hours**

Beams and Bending- Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions - Flitched Beams.

UNIT III DEFLECTION OF BEAMS **12 Hours**

Double integration method-Macaulay's methods-Area moment method-conjugate beam method for computation of slopes and deflections of determinant beams.

UNIT IV TORSION **12 Hours**

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – combined bending moment and torsion of shafts - strain energy due to torsion - Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – Leaf Springs – Springs in series and parallel – Design of buffer springs.

UNIT V COMPLEX STRESSES AND PLANE TRUSSES **12 Hours**

2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Principal Stresses and Principal Planes – Mohr's circle - Plane trusses: Analysis of plane trusses - method of joints - method of sections

TOTAL: 60 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Analysis of all types of horizontal determinate flexural members.
2. Categorize various materials by virtue of its different strength properties.

COURSE OUTCOMES:

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

CO1 Understand the fundamental concepts of stress and strain in mechanics of solids and structures.
CO2 Analyze the determinate beams and trusses to determine shear forces, bending moments and axial forces
CO3 Compute the maximum deflection of beam.
CO4 Analyze laminar and turbulent flows in circular pipes and energy losses in pipes
CO5 Discuss about the Principal Plane and stresses.

REFERENCES:

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.
2. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.
3. Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,1995.
4. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi 1997.
5. Bansal.R.K "Strength of materials", Laxmi Publications (P) Ltd, New Delhi 2014
6. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van NosReinbhold, New Delhi1995.

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1702CE303	FLUID MECHANICS	L	T	P	C
		3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To impart knowledge on the basic properties of the fluid
2. To impart knowledge in the area of fluid kinematics and fluid dynamics
3. To analyze and appreciate the complexities involved in solving the fluid flow problems

UNIT I FLUID STATICS **9 Hours**

Definitions - Continuum concept – Units and dimensions - Fluid Properties – Classification of fluids - Fluid Pressure and its measurements (manometers) - forces on immersed plane and curved surfaces – buoyancy – Meta centric height – fluid mass under relative equilibrium – Micro fluidics.

UNIT II KINEMATICS OF FLUIDS **9 Hours**

Lagrangian and Eulerian methods – Classification of fluids - Streamlines, path lines and streak lines - Continuity equation - Velocity potential and Stream function – Flow nets.

UNIT III FLUID DYNAMICS **9 Hours**

Euler and Bernoulli's equation – Application of Bernoulli's equation – Flow measurement – Laminar flow through parallel plates and pipes – Darcy-Weishbach friction factor – Turbulent flow.

UNIT IV PROBLEMS IN PIPE FLOW **9 Hours**

Major and minor losses in pipe flows – Pipes in series and parallel – Pipe networks – Concept of Boundary Layer Theory

UNIT V DIMENSIONAL ANALYSIS **9 Hours**

Rayleigh's method – Buckingham's Pi-theorem – model study and similitude – Practical applications.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. To analyze and create a solution for Fluid flow issues.
2. To minimize the losses in conveyance of fluids

COURSE OUTCOMES:

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

CO1 Understand the basic properties of fluids, and apply Newton's Law of Viscosity in solving practical problems

CO2 Understand the principles of kinematics with specific emphasis on application of continuity equation, stream function etc

CO3 Apply the principles of Bernoulli's equation in measurement of discharge in pipes, and in other pipe flow problems.

CO4 Apply fundamental concepts of fluid mechanics in solving fluid flow problems in pipes, design of pipe, and analysis of pipe networks.

CO5 Understand the fundaments of dimensional analysis and application of Buckingam π-theorem in fluid flow problem

REFERENCES:

1. Bansal, R.K., Mechanics of Fluids, Laxmi Publications, Pvt. Ltd, New Delhi, 1St Edition, 2005.
2. Rama Durgaiah,D., Fluid Mechanics and Machinery,New Age International Publishers, New Delhi, 1st Edition, Reprint, 2006.
3. Jain A.K"fluid mechanics" khanna publishers,2010
4. White f.m "fluid mechanics"tatamcgraw hill 5th edition, new 2000
5. K.L.kumar"fluidmechanichs"Eurasia publishing house(P)LTD. S.CHAND and company limited

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1702CE304	ENGINEERING GEOLOGY	L	T	P	C
		3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To summarize the origin, development and ultimate fate of various surface features of the earth.
2. To impart the understanding of rock forming minerals, their properties and classifications of rocks.
3. To analyze the geological structures and their effects due to geological factors.

UNIT I GENERAL GEOLOGY **9 Hours**

Geology in civil engineering – Branches of geology – Earth structures and composition –Elementary knowledge on continental drift and plate tectonics - Earth processes –Weathering – Geological work of rivers, wind and sea - Engineering importance – Earthquake belts in India - Groundwater – Mode of occurrence – Prospecting – Importance in civil engineering.

UNIT II MINERALOGY **9 Hours**

Introduction – Crystallography – Elements – Symmetry – Axes – Forms – Systems –Properties - physical - optical – Study of rock forming minerals - Felspar group - Orthoclase, microcline, albite, anorthite - pyroxenegroup - Enstatite, augite - Amphibole group - Anthophyllite, hornblende - Mica group – Muscovite, biotite - Oxide minerals - Quartz, corundum - Carbonate minerals – Calcite, dolomite, magnesite - Coal and petroleum – Origin and occurrence in India.

UNIT III PETROLOGY **9 Hours**

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks- Occurrence, engineering properties and distribution - Igneous rocks– Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt- sedimentary rocks - Sandstone, limestone, shale, conglomerate and breccia-Metamorphic rocks- quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD **9 Hours**

Introduction – Basic terminologies – Study of structural features – Folds, faults and joints -Engineering considerations - Geophysical investigations- Seismic and electrical.

UNIT V GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING **9 Hours**

Geological conditions necessary for construction of dams, tunnels, buildings, road cuttings- Landslides – Causes and preventions- improvement of sites.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

Geo Technical Engineering and Structural geology

COURSE OUTCOMES:

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

CO1 Understand weathering process and mass movement
CO2 Identify the available minerals by their properties and behavior.
CO3 Differentiate three important major rock types based on their origin, occurrence, engineering properties and uses.
CO4 Describe the geological structures fold, fault, joints etc, and identify the subsurface geological formations.
CO5 Describe the applications of geological concepts in civil engineering projects.

REFERENCES:

1. Parbin Singh, "Engineering and General Geology", S. K. Kataria & Sons, 2008.
2. Marland P.Billings, "Structural Geology", PHI Learing Pvt. Ltd. New Delhi, 2012
3. F.G.Bell, "Engineering Geology", Butterworth –Heinemann (An Imprint of Elsevier), 2007.
4. F.G.H. Blyth and M.H.de Freitas, "A Geology for Engineers", Butterworth –Heinemann (An Imprint of Elsevier), 2006

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1702CE305	BUILDING MATERIALS & RESOURCE PLANNING	L	T	P	C
		3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To give students an understanding of typical and potential application of Building materials.
2. To ensure that students know about the manufacturing process of Building materials and mix designing procedure of concrete.
3. Give students an appreciation of the effective use of common and modern materials in construction.

UNIT I STONES – BRICKS – CONCRETE BLOCKS **9 Hours**

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Cement, Concrete blocks – Lightweight concrete blocks.

UNIT II LIME – CEMENT – AGGREGATES – MORTAR **9 Hours**

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – Industrial byproducts – Fly ash – Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking.

UNIT III CONCRETE **9 Hours**

Concrete – Ingredients – Manufacturing Process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction Factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete – Other types of Concrete – Durability of Concrete.

UNIT IV TIMBER **9 Hours**

Timber – Market forms – Industrial timber– Plywood – Veneer – Thermacole – Panels of laminates – Steel Aluminium composite panel – Uses – Paints – Varnishes – Distempers – Bitumens.

UNIT V MODERN MATERIALS **9 Hours**

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials — Fibre textiles – Geo membranes and Geo textiles for earth reinforcement.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

On completion of this course the students will be able to Compare the properties of most common and advanced building materials and understand the typical and potential applications of these materials

COURSE OUTCOMES:

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

CO1 Summarize the most common and advanced materials used for construction.
CO2 Explain the manufacturing process of various building materials
CO3 Explain the properties of fresh and hardened concrete and performance of other types of concrete.
CO4 Illustrate the usage of timber, plywood and aluminum, composite material, paints and distemper
CO5 Choose the appropriate modern materials for construction

REFERENCES:

1. Varghese. P. C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Shetty. M. S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd., 2008.
4. Gambhir M. L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
5. Duggal. S. K., "Building Materials", 4th Edition, New Age International, 2008.

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1702CE351	SURVEYING LAB 1	L	T	P	C
		0	0	4	2

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

To introduce the principles of various surveying methods and using the survey instrument to Civil Engineering projects.

LIST OF EXPERIMENTS:

1. Study about Chain and accessories
2. Aligning, Ranging and chaining
3. Compass Traversing
4. Plane table surveying : Radiation
5. Plane table surveying : Intersection
6. Plane table surveying : Two point Problem
7. Fly leveling using Dumpy level
8. Check Leveling
9. LS and CS
10. Study of Theodolite

TOTAL: 45 HOURS

ADDITIONAL EXPERIMENTS / INNOVATIVE EXPERIMENTS :

1. Using in the field for taking leveling checking and measurements.
2. Electronic instrument

Employability

COURSE OUTCOMES:

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

CO1 On completion of this course student shall be able to understand the Surveying of the Lands and Pots use various method.

CO2 Understanding the working principle.

CO3 Understanding the methods of using the proper instrument for the method.

REFERENCES:

1. G. Brancato, S. Macchia, M. Murgia, M. Signore, G. Simeoni - Italian National Institute of Statistics, ISTAT
2. K. Blanke, T. Körner, A. Nimmergut - Federal Statistical Office Germany, FSO
3. P. Lima, R. Paulino - National Statistical Institute of Portugal, INE
4. J.H.P. Hoffmeyer-Zlotnik - German Center for Survey Research and Methodology, ZUMA

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1702CE352	STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	4	2

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To find the strength properties of different construction materials like steel, concrete, brick and timber.
2. To evaluate stiffness properties of springs and to find the hardness properties of various metals.

LIST OF EXPERIMENTS:

1. Tension test on Mild steel rod
2. Tension test on tor steel rod
3. Torsion test on MS bar
4. Tension and compression test on springs
5. Compression test on bricks and concrete cubes
6. Water absorption test on bricks
7. Brinell and Rockwell Hardness test
8. Compression and bending test on wood specimens
9. Charpy and Izod Impact Test
10. Double shear test
11. Test on cement

TOTAL: 45 HOURS

ADDITIONAL EXPERIMENTS / INNOVATIVE EXPERIMENTS :

-

COURSE OUTCOMES:

Employability

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

CO1 The experimental works involved in this laboratory make the student to determine the properties of different structural elements.

CO2 The student should be able to obtain the strength of the material and stiffness properties of structural elements.

REFERENCES:

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
2. IS1786-2008, Specification for cold worked steel high strength deformed bars for concrete reinforcement, 2008.

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1704CE353	TECHNICAL SEMINAR I	L	T	P	C
		0	0	2	0

PREREQUISITE :

-

COURSE OBJECTIVES:

1. To develop self-learning skills of utilizing various technical resources to make a technical presentation.
2. To promote the technical presentation and communication skills.
3. To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
4. To promote the ability for Interacting and sharing attitude.
5. To encourage the commitment-attitude to complete tasks.

The students are expected to make two presentations on advanced topics (recent trends) related to II year/ III semester subjects. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as power point presentation and demonstrative models.

TOTAL: 30 HOURS

COURSE OUTCOMES:

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

CO1 Identify and utilize various technical resources available from multiple field.
CO2 Improve the technical presentation and communication skills.
CO3 Improve communicative competence.
CO4 Interact and share their technical knowledge.
CO5 Understand and adhere to deadlines and commitment to complete the assignments.

EVALUATION SCHEME:

Continuous Assessment (100 Marks)

Distribution of Marks for Continuous Assessment	**Marks**
Presentation I	40
Report	10
Presentation II	40
Report	10
Total	**100**

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1704GE351	LIFE SKILLS : SOFT SKILLS (Common to all B.E / B.Tech Degree Programmes)	L 0	T 0	P 2	C 0

PREREQUISITE :

1. Technical English
2. Communicative English

COURSE OBJECTIVES:

1. To develop the students basic soft skills and enable them to get a job.
2. To develop the students' interpersonal skills and to enable them to respond effectively.
3. To develop the students selling skills and to enable them to apply in their interview process.
4. To develop the students' Corporate Etiquettes and enable them to respond effectively.
5. To develop the students' learning by practice of giving different situations.

UNIT I INTRODUCTION TO SOFT SKILLS **6 Hours**

Soft Skills an Overview - Basics of Communication – Body Language – Positive attitude –Improving Perception and forming values – Communicating with others.

UNIT II TEAM Vs TRUST **6 Hours**

Interpersonal skills – Understanding others – Art of Listening - Group Dynamics – Networking - Individual and group presentations - Group interactions – Improved work Relationship .

UNIT III SELLING ONESELF **6 Hours**

How to brand oneself – social media – job hunting – Resume writing – Group Discussion – Mock G.D - .Interview skills – Mock Interview

UNIT IV CORPORATE ETIQUETTES **6 Hours**

What is Etiquette – Key Factors – Greetings – Meeting etiquettes – Telephone etiquettes – email etiquettes – Dining etiquettes – Dressing etiquettes – Rest room etiquettes – Life etiquettes.

UNIT V LEARNING BY PRACTICE **6 Hours**

1. My family. Myself. 2. Meeting people. Making Contacts. 3. A city. Getting about town. 4. Our flat. Home life.5. Travelling. Going abroad. 6. Going through Customs. 7. At a hotel. 8. Shopping. 9. Eating out. 10. Making a phone call. 11. A modern office.12 Discussing business.

TOTAL: 30 HOURS

ASSSESSMENT PATTERN

1. Two assignments (2 x 25 marks = 50 marks)
2. Pragmatic assessment (50 marks)

COURSE OUTCOMES:

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

CO1 Communicate effectively in their business environment.
CO2 Improve their interpersonal skills which are mandatory in a corporate world.
CO3 Brand themselves to acquire a job.
CO4 Involve in corporate etiquettes.
CO5 Survive in the different situations.

REFERENCES:

1. Dr.K.Alex, 'Soft Skills' Third Edition, S.Chand & Publishing Pvt Limited, 2009
2. Aruna Koneru, 'Professional Communication' Second Edition, Tata McGraw-Hill Education, 2008
3. D.K.Sarma, 'You & Your Career' First Edition, Wheeler Publishing & Co Ltd, 1999
4. Shiv Khera 'You Can Win' Third Edition, Mac Millan Publisher India Pvt Limited, 2005

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E.G.S. PILLAY ENGINEERING COLLEGE

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Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

B.E. CIVIL ENGINEERING

Second Year – Fourth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702MA403	Numerical Methods and Statistics	3	2	0	4	40	60	100
1702CE401	Engineering Surveying II	3	0	0	3	40	60	100
1702CE402	Solid Mechanics II	3	1	0	4	40	60	100
1702CE403	Applied Hydraulic Engineering	3	0	0	3	40	60	100
1702CE404	Geotechnical Engineering I	3	0	0	3	40	60	100
1702CE405	Transportation Engineering	3	0	0	3	40	60	100
Laboratory Course								
1702CE451	Hydraulic Engineering Lab	0	0	4	2	50	50	100
1702CE452	Geotechnical Engineering Lab	0	0	4	2	50	50	100
1702CE453	Surveying Lab II	0	0	4	2	50	50	100
1704CE454	Technical Seminar II	0	0	2	0	100	-	100
1704GE451	Life Skills: Verbal Ability	0	0	2	0	100	-	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1702MA403	NUMERICAL METHODS AND STATISTICS (Common to B.E - Civil, EEE and Mech.)	L 3	T 2	P 0	C 4

PREREQUISITE:

1.Engineering Mathematics I
2.Engineering Mathematics II
3.Engineering Mathematics III

COURSE OBJECTIVES:

1.To sole the engineering problem, by use of numerical tools
2.To understand the concept of interpolation
3.To analyze the population and samples using statistics techniques

UNIT I INTERPOLATION AND APPROXIMATION **12 Hours**

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT II NUMERICAL DIFFERENTIATION **12 Hours**

Approximation of derivatives using interpolation polynomials-Taylor's series method – Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations

Unit III NUMERICAL INTEGRATION **12 Hours**

Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's method - Two point and three Point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS **12 Hours**

Solution of algebraic and transcendental equations - Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel

UNIT V TESTING OF HYPOTHESIS **12 Hours**

Large sample test based on Normal distribution for single mean and difference of means - Tests based on t and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit

TOTAL: 60 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1.Finding Eigen value using power method
2.Cubic Spline

COURSE OUTCOMES:

After completion of the course, Students will be able to

CO1: To find the intermediate values, when huge amounts of experimental data are involved.
CO2: To solve first order differential equation using Numerical methods
CO3: To perform Integration using Numerical methods
CO4: To solve algebraic and transcendental Equations numerically
CO5: Analyses the statistical data

REFERENCES:

1. Johnson R.A.Gupta C. B, Miller and Freunds Probability and statistics for Engineers, 7th edition ,Pearson Education,2007
2. Grewal B.S and Grewal J.S, Nummerical methods in Engineering and Science, 6th edition, Khanna Puplishers,2004
3. Walpole R.E. Myers S.L ,Ye.K, Probability and statistics for Engg and scientists, 8th edition Pearson education,2007
4. Gerald C.F Wheatley P.O, Applied Numerical Analysis, 6th edition ,Pearson education Asia 2006
5. Nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
6. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.html
7. www.indiastudychannel.com

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1702CE401	ENGINEERING SURVEYING II	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. Students Known about the Basic knowledge of chain surveying.
2. Students known about the knowledge of Levelling.
3. Knowledge about the Marking.

COURSE OBJECTIVES:

1. This subject deals with geodetic measurements and control survey method
2. The student is also exposed to the Modern Surveying

UNIT I CONTROL SURVEYING **9 Hours**

Horizontal and vertical Controlsurveying – Instrument and Accessories – Corrections – Trigonometrical leveling – single and reciprocal observation traversing.

UNIT II SURVEYING ADJUSTMENT **9 Hours**

Errors Sources- classification of errors – true and most probable Values- weighed observations – method of equal shifts –principle of least squares – Normal Equation – correlates

UNIT III CURVES **9 Hours**

Introduction – Types of curves – Designation of curves – Elements of simple circular curve –simple problems – Transition curves – vertical curves.

UNIT IV GPS SURVEYING **9 Hours**

Basic concept – Different segment - -Space, Control and user segments – satellite configuration – signal structure – Hand held and geodetic receivers.

UNIT V TOTAL STATION SURVEYING **9 Hours**

Basic Principle – Classification – Measuring principle, Working principle, Sources of errors – Infrared and Laser Total station instruments. Care and maintenances of total station instruments.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1.Building Marking in the construction field using Total station
2.Levelling work in the Highways Railways and Airways using Total station

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1: Completion of this course students shall be able to understand the advantages
CO2: Electronic surveying over conventional surveying methods
CO3: Understand the working principle of GPS, its components, signal structure, and error sources
CO4: Understand various GPS surveying methods and processing techniques used in GPS observations
CO5: Improve ability to function as a survey party in completing the assigned field work
CO6: Appreciate the need for licensed surveyors to establish positioning information for property and structures.

REFERENCES:

1. Alfred Leick, "GPS satellite surveying", JohnWiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, "GPS Theory, Algorithms and Applications", Springer - Berlin, 2003.
3. Satheesh Gopi, rasathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Ha of India, 2004.
5. Arora K.R.,"Surveying Vol 1 & 2", Standard Book House, 10th Edition 2008.

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1702CE402	SOLID MECHANICS - II	L	T	P	C
		3	1	0	4

PREREQUISITE:

Solids Mechanics -I

COURSE OBJECTIVES:

1. To impart knowledge on Energy principles, stress, Strain and deformation of solids with applications to beams, cylinders and unsymmetrical sections.
2. To acquire the ability to analyze the mechanism of load transfer in columns
3. To develop the clear understanding of the shear force and bending moment in indeterminate beams.

UNIT I ENERGY PRINCIPLES **9 Hours**

Strain energy and strain energy density – strain energy due to axial load, shear, flexure and torsion – Castigliano"s theorems –Principle of virtual work – application of energy theorems for computing deflections in beams and trusses

UNIT II INDETERMINATE BEAMS **9 Hours**

Concept of Analysis - Propped cantilever and fixed beams-fixed end moments and reactions – Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNS AND CYLINDER **9 Hours**

Euler"s theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns – middle third rule – core section – Thick cylinders.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS **9 Hours**

Determination of principal stresses and principal planes – Volumetric strain –Theories of failure – Principal stress - Principal strain – shear stress – Strain energy and distortion energy theories – application in analysis of stress, load carrying capacity.

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS **9 Hours**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre

TOTAL: 45+15 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Analysis of all types of flexural members
2. Approaching the flexural members with different kinds of stress analysis

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1: Identify the deflection in beams and frames using energy theorems
CO2: Explain the indeterminate beams like continuous beams and fixed beams in structures.
CO3: Illustrate the load carrying capacity of columns
CO4: Calculate the stresses in thick cylinders.
CO5: Compute the state of stress in three dimensions
CO6: Apply the stresses due to unsymmetrical bending.

REFERENCES:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2010.
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012
3. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
4. William A .Nash, "Theory and Problems of Strength of Materials", Schaum"s Outline Series, Tata
5. McGraw Hill Publishing company, 2007
6. PunmiaB.C."Theory of Structures" (SMTS) Vol 1&II, Laxmi Publishing Pvt Ltd, New Delhi 2004.
7. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
8. Bansal.R.K "Strength of materials", Laxmi Publications (P) Ltd, New Delhi 2014.

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1702CE403	APPLIED HYDRAULIC ENGINEERING	L	T	P	C
		3	0	0	3

PREREQUISITE:

1.Knowledge about fluid properties and equations on fluid flow

COURSE OBJECTIVES:

1. To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines
2. To relate the theory and practice of problems in hydraulic engineering

UNIT I UNIFORM FLOW **12 Hours**

Open channel – Differences between pipe flow and open channel flow - Types of flow – Properties of open channel - velocity distribution – Chezy's equation – Empirical formulae for Chezy's constant - Most economical section - specific energy concept

UNIT II GRADUALLY VARIED FLOW **8 Hours**

Dynamic equations of GVF – Classification of flow profiles – Computation of GVF profiles – Direct Step Method and Standard Step Method.

UNIT III RAPIDLY VARIED FLOW **7 Hours**

Momentum equation for RVF - Hydraulic jumps - Classification of Jumps – Surges

UNIT IV TURBINES **9 Hours**

Classifications of turbine – velocity triangle diagram for Pelton, Francis and Kaplan Turbine – Specific speed - Characteristics curves for turbines – Draft tube.

UNIT V PUMPS **9 Hours**

Classification of pumps – Centrifugal pump – minimum speed to start the pump – NPSH – operating characteristics – Multistage pumps – Reciprocating pump – Negative slip - indicator diagrams – air vessels

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1.Field visit on irrigation structures

COURSE OUTCOMES:

Employability

After completion of the course, Student will be able to

CO1: Apply the Chezy's & Manning's equation for finding the most economical section of a channel for uniform flow
CO2: Describe the specific energy concepts in open channel flow
CO3: Discover the type of water surface profile based on Gradually varied flow equation
CO4: Apply the Rapidly varied flow equations for hydraulic jump and surges
CO5: Identify the turbines based on their efficiencies for hydroelectric projects
CO6: Identify the required pumps for the hydraulic projects

REFERENCES:

1. Modi, P.N., & Seth, S.M., Hydraulics and Fluid Mechanics including Fluid Machines Standard Book House, New Delhi, 2000
2. Rama Durgaiah,D., Fluid Mechanics and Machinery, New Age International Publishers, New Delhi, 1st Edition, Reprint, 2006.
3. Chow, V.T., Open Channel Hydraulics, Blackburn Press, 2nd Edition, Reprint, 2009
4. JAINA.K "Fluid Mechanics" Khanna Publishers, New Delhi.
5. Bansal.R.K., Fluid Mechanics and Hydraulic Machines, Laxmi Publication (P) Ltd., New Delhi, 2018

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1702CE404	GEOTECHNICAL ENGINEERING I	L	T	P	C
		3	0	0	3

PREREQUISITE:

1. Knowledge about engineering behavior of fluid properties
2. Knowledge about mechanical properties of solids.

COURSE OBJECTIVES:

1. Provide the description, classification and to know about properties of soil.
2. Familiarize the students an understanding of permeability and seepage of soils
3. To know about the consolidation and compaction effect on soil in lab and field.

UNIT I INTRODUCTION **9 Hours**

Definition of soil and soil mechanics – Formation of soil – types of soil – Three phase system of soil and their relationships – Specific gravity – Definition – Determination – Field density - sand replacement and core cutter method.

UNIT II INDEX PROPERTIES **9 Hours**

Classification of soil – Grain size analysis – Stoke's law and hydrometer analysis– Consistency of soils – Atterberg's limit - Liquid limit, Plastic limit and Shrinkage limit – Determination - plasticity index, liquidity index , consistency index ,shrinkage ratio, flow index and toughness index – Classification of coarse grained and fine grained soil as per BIS.

UNIT III PERMEABILITY AND SEEPAGE **9 Hours**

Permeability –Definition – Assumption - one dimensional flow through soil – Darcy's law – Limitations - Discharge velocity and seepage velocity – factors affecting the permeability – permeability determination - lab and field methods – permeability in stratified soil deposits – Introduction of flow net and its properties - application of flow net.

UNIT IV COMPACTION AND CONSOLIDATION **9 Hours**

Compaction – field and lab methods – Proctor's test – factors affecting the compaction – California Bearing Ratio (CBR) test – effect of compaction in soil properties – Consolidation – Terzaghi's theory of one dimensional consolidation - partial differential equation (no analytical solution) – Lab method - coefficient of consolidation – Determination - $\sqrt{t}$ and log t methods.

UNIT V STRESS DISTRIBUTION AND SHEAR STRENGTH **9 Hours**

Introduction – stresses in soil – concept of effective and neutral stresses – stress distribution in soil media – Boussinesq and Westergrads analysis – Point load , Uniformly distributed load , line load – rectangular load - pressure bulb –Newmark's chart – Introduction. Shear strength – shear strength of cohesive and cohesion less soils – Mohr coulomb's theory –Direct shear, Triaxial, unconfined shear strength – Lab and field vane shear test - factors affecting the shear strength.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

COURSE OUTCOMES: Employability

After completion of the course, Student will be able to

CO1: Discuss the relationship of three phases of soil
CO2: Describe the various properties of soil and its classification.
CO3: Calculate the permeability of water in soil.
CO4: Explain compaction and consolidation of soil
CO5: Interpret the shear strength of the soil
CO6: Explain the various types of stress distribution in soil media.

REFERENCES:

1. Raju .K.V.B and Ravichandran .P.T, "Mechanics of Soils", Ayyappaa Publications, 2000.
2. Punmia .B.C, "Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., 2005.
3. Gopal Ranjan and Rao .A.S.R, "*Basic and Applied Soil Mechanics*", New age international (p) Ltd., 2007.
4. Terzaghi .K and Peck .R.B, "Soil Mechanics in Engineering Practice", JohnWiley Ltd., 1996
5. Arora .K.R, "Soil Mechanics and Foundation Engineering", Standard Publication Distributors, 2011.

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1702CE405	TRANSPORTATION ENGINEERING	L	T	P	C
		3	0	0	3

PREREQUISITE:

1.Basic engineering &fundamental knowledge on materials

COURSE OBJECTIVES:

1.To understand the importance of transportation and characteristics of road transport
2.To know about the history of highway development, surveys and classification of road
3.To study about the geometric design of highways
4.To study about traffic characteristics and design of intersections
5.To know about the pavement materials and design

UNIT I HIGHWAY GEOMETRY **9 Hours**

Importance Road transportation, Highway alignment – Requirement, Engineering surveys for Highway location. Maps & drawings to be prepared. Geometric design – Cross section element, width, camber, design – speed, sight distances, requirements and design of horizontal and vertical alignments.

UNIT II HIGHWAY MATERIALS **9 Hours**

Highway materials – Properties of sub-grade pavement component materials – Tests on aggregates, Sub-grade soil& bituminous materials. Different material-Glass, Fiber, Plastic, Geo-Textiles,Geo-membrane

UNIT III CONSTRUCTION AND MAINTENANCE **9 Hours**

Pavement construction techniques – Types of pavements – Construction of bituminous pavements and rigid pavements. Pavement failures and their remedies. Pavement evaluation

UNIT IV PAVEMENT DESIGN **9 Hours**

Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments.

UNIT V TRAFFIC PLANNING AND DESIGN **9 Hours**

Road Characteristics, Road user and vehicle characteristics, -, Intersections: at grade intersections, grade separated, intersections, channelized intersections and rotary, new work pedestrian facilities& cycle tracks.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. They can get the knowledge in transportation system

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1: Explain geometric design of horizontal and vertical alignments of roads rural and urban
CO2: Summarize the desirable properties of highway materials for constructions
CO3: Explain the pavement construction technique for flexible and rigid pavement
CO4: Explain the design of flexible and rigid pavements using IRC methods.
CO5: Interpret the flow speed, density based on road user and vehicle characteristic
CO6: Illustrate various methods of traffic control measures.in urban area

REFERENCES:

1. Veeraragavan.A, Khanna. S.K., Ceg Justo, Highway Engineering, Nem Chand & Brothers, 2014
2. Sharma, S.K. " Principles Practice and Design of Highway Engineering ", S. Chand & Co Ltd, 2013
3. Gupta B.L and Amith Gupta, Highway and Bridge Engg., Standard publishers, and Distributor, 2010
4. ParthaChakroborthy and Animesh Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2013.
5. LrKadiyali, LrKadyali, NbLal ," Principles and practice of highway engineering ", Khanna Publishers.2013
6. Rangwala.S.C, Highway Engineering, Charotar Book Distributors, 2013

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1702CE451	HYDRAULICS ENGINEERING LAB	L	T	P	C
		0	0	4	2

PREREQUISITE :

1.Fluid properties,
2.Applied hydraulics engineering

COURSE OBJECTIVES:

1. To acquire knowledge about properties of fluid
2. To understand knowledge about the losses in pipes
3. To understand knowledge about the characteristics of pumps and turbines

LIST OF EXPERIMENTS:

1. Calibration of Rotometer
2. Flow through Venturimeter Orifice meter
3. Flow through variable duct area - Bernoulli's Experiment
4. Flow through Orifice meter Mouthpiece and Notches
5. Determination of friction coefficient in pipes
6. Determination of loss coefficients for pipe fittings
7. Characteristics of Centrifugal pumps
8. Characteristics of Gear pump
9. Characteristics of Submersible pump
10. Characteristics of Reciprocating pump
11. Characteristics of Pelton wheel turbine
12. Characteristics of Francis turbine
13. Characteristics of Kaplan turbine

TOTAL:45 HOURS

ADDITIONAL EXPERIMENTS/ INNOVATIVE EXPERIMENTS:

1.Characteristics of multi stage Centrifugal pumps
2.Characteristics of jet on vane

COURSE OUTCOMES: Employment

After completion of the course, Student will be able to

CO1: Measure the flow properties of fluid.
CO2: Conduct the experiment to find the losses in pipes
CO3: Conduct experiment to find characteristics curves of various pumps
CO4: Conduct experiment to find characteristics curves of various turbines

REFERENCES:

1. SarbjitSingh."Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009
2. Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
3. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
4. Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing. Company, 2001

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1702CE452	GEOTECHNICAL ENGINEERING LAB	L	T	P	C
		0	0	4	2

PREREQUISITE:

COURSE OBJECTIVES:

1. To provide exposure to the students with hands on experience about classification of the soil.
2. To grant knowledge about field density of the soil.
3. To impart the knowledge about basic bearing capacity of the soil.
4. To attains adequate knowledge in assessing both Physical and Engineering behavior of soils through laboratory testing procedures.

LIST OF EXPERIMENTS:

1. Determination of specific gravity
2. Determination of grain size distribution of Sieve Analysis
3. Determination of grain size by Hydrometer
4. Determination of Liquid limit and Plastic of the soil
5. Determination of Shrinkage limit of the soil
6. Determination of Dry density by Standard Proctor Compaction test
7. Determination of Field density by Core cutter method
8. Determination of Field density by Sand Replacement method
9. Determination of Permeability Coefficient using Constant head method
10. Determination of Permeability Coefficient using Variable head method
11. Determination of shear strength by using Direct Shear test
12. Determination of compression strength by using Unconfined compressive strength test

TOTAL : 45 HOURS

ADDITIONAL EXPERIMENTS/ INNOVATIVE EXPERIMENTS:

1. Consolidation Test
2. Triaxial Test

COURSE OUTCOMES: Employement

After completion of the course, Student will be able to

CO1: Develop experience to classify the soil

CO2: Identify the concept of optimum moisture content of the soil.

CO3: Recognize the concept of field density of the soil.

CO4: Practice of the concept to do performance test on Compressive and shear strength

CO5: Apply the techniques to determine index properties and engineering properties by conducting appropriate tests.

REFERENCES:

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2007
2. GopalRanjan and Rao A.S.R. "Basic and Applied soil mechanics", Wiley Eastern Ltd, New Delhi
3. (India), 2000.
4. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New
5. Delhi, 2002.
6. Soil Engineering Laboratory Instruction Manual" published by Engineering College Co- operative Society, Anna University, Chennai, 1996.
7. Saibaba Reddy, E. Ramasastri, K. "Measurement of Engineering Properties of Soils", New age International (P) Limited Publishers, New Delhi, 2002
8. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1990.

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1702CE453	SURVEYING LAB II	L	T	P	C
		0	0	4	2

PREREQUISITE:

1. Surveying I
2. Surveying Lab I

COURSE OBJECTIVES:

1. This subject deals with Electronic Survey method. The student is also exposed to the Modern Surveying.

LIST OF EXPERIMENTS:

1. Study of the odolite
2. Determination of Horizontal Angles by Reiteration method
3. Determination of Horizontal Angles by Repetition method
4. Determination of Vertical Angles
5. Theodolite survey - Traversing method
6. Determination of Height and distance of the object
7. Tacheometry Tangential system
8. Setting out work – Foundation Marking and Simple curve
9. Study of Total station

TOTAL : 45 HOURS

ADDITIONAL EXPERIMENTS/ INNOVATIVE EXPERIMENTS:

1. Building Marking
2. Road Alignment

COURSE OUTCOMES: Employment

After completion of the course, Student will be able to

CO1: On completion of this course student shall be able to understand the advantages of the Electronic instrument and working in the field.

CO2: Understanding the methods of using the proper instrument for the method.

REFERENCES:

1. G. Brancato, S. Macchia, M. Murgia, M. Signore, G. Simeoni - Italian National Institute of Statistics, ISTAT
2. K. Blanke, T. Körner, A. Nimmergut - Federal Statistical Office Germany, FSO
3. P. Lima, R. Paulino - National Statistical Institute of Portugal, INE
4. J.H.P. Hoffmeyer-Zlotnik - German Center for Survey Research and Methodology, ZUMA

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1704CE454	TECHNICAL SEMINAR II	L	T	P	C
		0	0	2	0

COURSE OBJECTIVES:

1. To develop self-learning skills of utilizing various technical resources to make a technical presentation.
2. To promote the technical presentation and communication skills.
3. To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
4. To promote the ability for Interacting and sharing attitude.
5. To encourage the commitment-attitude to complete tasks.

The students are expected to make two presentations on advanced topics (recent trends) related to II year/ III semester subjects. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as power point presentation and demonstrative models.

TOTAL: 30 HOURS

COURSE OUTCOMES: Entrepreneurship

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

CO1 Identify and utilize various technical resources available from multiple field.
CO2 Improve the technical presentation and communication skills.
CO3 Improve communicative competence.
CO4 Interact and share their technical knowledge.
CO5 Understand and adhere to deadlines and commitment to complete the assignments.

EVALUATION SCHEME:

Continuous Assessment (100 Marks)

Distribution of Marks for Continuous Assessment	**Marks**
Presentation I	40
Report	10
Presentation II	40
Report	10
Total	**100**

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1704GE451	LIFE SKILLS: VERBAL ABILITY	L	T	P	C
		0	0	2	0

PREREQUISITE:

Technical English – I and II

COURSE OBJECTIVES:

1. To help students comprehend and use vocabulary words in their day to day communication.
2. To apply appropriate reading strategies for interpreting technical and non-technical documents used in job-related settings.
3. To ensure students will be able to use targeted grammatical structures meaningfully and appropriately in oral and written production.
4. To enable the students to arrange the sentences in meaningful unit and to determine whether constructions rely on active or passive voice.
5. To apply the principles of effective business writing to hone communication skills.

UNIT I VOCABULARY USAGE **6 Hours**

Introduction - Synonyms and Antonyms based on Technical terms – Single word Substitution – Newspaper, Audio and video listening activity.

UNIT II COMPREHENSION ABILITY **6 Hours**

Skimming and Scanning – Social Science passages – Business and Economics passages – latest political and current event based passages – Theme detection – Deriving conclusion from passages.

UNIT III BASIC GRAMMAR AND ERROR DETECTION **6 Hours**

Parallelism – Redundancy – Ambiguity – Concord - Common Errors – Spotting Errors – Sentence improvement – Error Detection FAQ in Competitive exams.

UNIT IV REARRANGEMENT AND GENERAL USAGE **6 Hours**

Jumble Sentences – Cloze Test - Idioms and Phrases – Active and passive voice – Spelling test.

UNIT V APPLICATION OF VERBAL ABILITY **6 Hours**

Business Writing - Business Vocabulary - Delivering Good / Bad News - Media Communication - Email Etiquette – Report Writing - Proposal writing – Essay writing– Indexing –Market surveying.

Total: 30 Hours

ASSESSMENT PATTERN

1. Two assignments (2 x 25 marks = 50 marks)
2. Pragmatic assessment (50 marks)

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1: Use new words in their day to day communication.

CO2: Gather information swiftly while reading passages.

CO3: Students are proficient during their oral and written communication.

CO4: Rearrange the sentences and able to identify the voice of the sentence.

CO5: Students use their knowledge of the best practices to craft effective business documents

REFERENCES:

1. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017.
2. R S Aggarwal and Vikas Aggarwal , Quick Learning Objective General English, S.Chand Publishing House, 2017.
3. Dr.K.Alex , Soft Skills, S.Chand Publishing House, Third Revise Edition, 2014.
4. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition, 2007.

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E.G.S.PILLAY ENGINEERING COLLEGE

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CIVIL, IT)

NAGAPATTINAM–611002

B.E. Civil Engineering

FullTime Curriculum and Syllabus

SEMESTER V									
Course Code	Course Name	L	T	P	C	Maximum Marks			Category
						CIA	ES	Total	
Theory Course									
1702CE501	Structural Analysis I	3	2	0	4	40	60	100	PC
1702CE502	Concrete Structures I	3	0	0	3	40	60	100	PC
1702CE503	Concrete Technology	3	0	0	3	40	60	100	HS
1702CE504	Geotechnical Engineering II	3	0	0	3	40	60	100	PC
1703CE001	Remote Sensing and GIS (Elective I)	3	0	0	3	40	60	100	PE
1703CE006	Solid Waste Management (Elective II)	3	0	0	3	40	60	100	PE
Laboratory Course									
1702CE551	Computer Aided Building and Drawing Lab	0	0	4	2	40	60	100	PC
1702CE552	Survey Camp*	0	0	0	1	100	0	100	PC
1704CE553	Mini Project I	0	0	2	1	100	0	100	PC
1704GE551	Life Skills: Aptitude - I	0	0	2	1	100	0	100	EEC
Total		**18**	**4**	**08**	**24**	**580**	**420**	**1000**	-

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1702CE501	STRUCTURAL ANALYSIS I	L	T	P	C
		3	2	0	4

Course Objectives:

1. To understand the concept of analysis of indeterminate structures.
2. To Understand the methods of analysis of indeterminate trusses for external loads, lack of fit and thermal effects and also the influence line concept for indeterminate structure.
3. To study behavior of arches, Settlement and temperature effects.

Unit I **INDETERMINATE FRAMES** **12 Hours**

Degree of static and kinematic indeterminacies for plane frames – analysis of indeterminate pin-jointed frames – rigid frames (Degree of statical indeterminacy up to two) – Energy and consistent deformation methods.

Unit II **SLOPE DEFLECTION METHOD** **12 Hours**

Analysis of continuous beams - sinking of supports – rigid frames (with and without sway)

Unit III **MOMENT DISTRIBUTION METHOD** **12 Hours**

Distribution and carryover of moments – Stiffness and carry over factors - Analysis of continuous beams - sinking of supports – Rigid frames (with and without sway).

Unit IV **MOVING LOADS AND INFLUENCE LINES** **12 Hours**

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections –Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames.

Unit V **ARCHES** **12 Hours**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

Total: 45 + 15 Hours

Further Reading:

1. To analyze and find out BMD

Course Outcomes:

After completion of the course, Student will be able to

1. Analyze The Pin Jointed Plane Frames Using Energy And Consistent Deformation Method.
2. Analyze Indeterminate Structures Using Slope Deflection Method.
3. Analyze Indeterminate Structures Using Moment Distribution Method.
4. Analyze Indeterminate Beams With Moving Loads.
5. Analyze the arches under external loads, temperature effects and support settlements.

References:

1. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications Pvt. Ltd, New Delhi, 2003.
2. L.S. Negi& R.S. Jangid, "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.
3. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, " Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004
4. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi,2013.
5. BhavaiKatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008
6. Wang C.K. , "Indeterminate Structural Analysis", Tata McGraw Hill Education Pvt. Ltd.,New Delhi, 2010
7. DevadasMenon, "Structural Analysis", Narosa Publishing House, 2008
8. Ghali.A., Nebille and Brown. T.G., "Structural Analysis - A unified classical and matrix approach" Sixth Edition, SPON press, New York, 2013.
9. Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt.Ltd., New Delhi, 2011.

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1702CE502	CONCRETE STRUCTURES I	L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop an understanding on the basic concepts in the behaviour and design of reinforced concrete systems and elements using working stress method.
2. To introduce the basic concepts and steps in the design of beams and slabs mainly in accordance with Limit state method.
3. To underline the design principles of RC members for shear, bond, and torsion.
4. To introduce the concepts in the design of RC Column design.
5. To give the knowledge in the concept of RC footings.

Unit I **FUNDAMENTALS** **9 Hours**

Stages in structural design - Structural planning - Design philosophies - Working stress method - Ultimate load method - Limit state method - Characteristic strength - Characteristic load - Design values - Partial safety factors - Codal provisions - Practical aspects of design - Design of flexural members and slabs by working stress method.

Unit II **LIMIT STATE DESIGN FOR FLEXURE** **9 Hours**

Analysis and design of One way and two way slabs – Singly and doubly reinforced rectangular and flanged beams - Cantilever beams - Standard method of detailing of RC beams and slabs.

Unit III **LIMITSTATEDESIGN FOR BOND, ANCHORAGE, SHEAR AND TORSION** **9 Hours**

Behaviour of RC members in bond and anchorage – Curtailment of reinforcement - Design requirements as per code provision – Behaviour of RC beams in shear and torsion - Design of RC members for combined bending, shear and torsion.

Unit IV **LIMIT STATE DESIGN OF COLUMNS** **9 Hours**

Columns – Assumptions – Effective length – Classification – Design guidelines – Axially loaded short columns with lateral ties and helical reinforcement – Columns subjected to uni-axial bending and biaxial bending – Slender columns - Standard method of detailing of RC columns.

Unit V **LIMIT STATE DESIGN OF FOOTING** **9 Hours**

Introduction and selection of footing under different site conditions - Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Combined footing - Standard method of detailing of RC footing.

Total: 45 Hours

Further Reading :

1. students can be able to design whole elements in a building
2. students can be able to select suitable footing type

Course Outcomes:

After completion of the course, Student will be able to

1. Know the basic principles of different design methods
2. Design flexural members using limit state method under different loading and end conditions.
3. Design flexural members of any cross sectional shape for shear, bond, and torsion.
4. Design RC columns of any cross section with different end conditions.
5. Select and design RC footing of different cross section under various site conditions

References:

1. B. C Punmia, Ashok. Kumar Jain, Arun Kumar Jain "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd, NewDelhi 2007.
2. UnnikrishnaPillai, S., DevdasMenon, "Reinforced Concrete Design",Tata McGraw-Hill Publishing Company Ltd., New Delhi 2003.
3. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi 2002.
3. Varghese, P.C., "Limit State Design of Reinforced Concrete",Prentice Hall of India, Pvt. Ltd., New Delhi 2002
4. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2003.

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1702CE503	CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Objectives:

1. To impart knowledge of building materials used in construction.
2. To train in various test for fresh and hardened concrete
3. To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete and special concretes

Unit I	CONSTITUENT MATERIALS	**9 Hours**

Cement-Different types-Chemical composition and Properties -Tests on cement-IS Specifications- Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements- Water- Quality of water for use in concrete.

Unit II	CHEMICAL AND MINERAL ADMIXTURES	**9 Hours**

Accelerators-Retarders- Plasticisers- Super plasticizers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline -Their effects on concrete properties

Unit III	PROPORTIONING OF CONCRETE MIX	**9 Hours**

Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix-BIS Method of Mix Design - Mix Design Examples

Unit IV	FRESH AND HARDENED PROPERTIES OF CONCRETE	**9 Hours**

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete-Determination of Compressive and Flexural strength-Stress-strain curve for concrete-Determination of Young's Modulus

Unit V	SPECIAL CONCRETES	**12 Hours**

Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete - SIFCON-Shotcrete – Polymer concrete - High performance concrete- Geopolymer Concrete.

Total:	**45 + 15 Hours**

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the properties of various ingredients of concrete
2. Interpret the suitable admixture for concrete with special propertie
3. Apply the concrete mix using I.S code methods
4. Illustrate the properties of fresh and hardened concrete
5. Explain the special concrete and their specific applications interpret

References:

1. Santhakumar,A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007
2. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995
3. Gambir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New

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1702CE504	GEOTECHNICAL ENGINEERING II	L	T	P	C
		3	0	0	3

Course Objectives:

1.Familiarize the students with a basic understanding of the essential stepsinvolved in a geotechnical site investigation.
2.Introduce to the students, the principal types of foundations and the factorsgoverning the choice of the most suitable type of foundation for a givensolution.
3.Familiarize the student with the procedures used for : a) bearing capacityestimation, b) load carrying capacity of pile, c) determining earth pressureand e) concept on stability of slope.

Unit I	SOIL EXPLORATION AND SITE INVESTIGATION	9 Hours

Introduction – Planning and stages in sub-surface exploration – depth and spacing of exploration – Methods of exploration – Test pit – Trenches – Geophysical methods: Seismic refraction and Electrical resistivity method –Boring : Auger boring, Shell and Auger, Wash boring and Rotary drilling – Types of soil sample: disturbed and undisturbed soil samples – Features of sampler affecting soil disturbance – standard penetration test – static and dynamic cone penetration test – bore log report

Unit II	SHALLOW FOUNDATION AND BEARING CAPACITY	9 Hours

Introduction – Bearing capacity- definition – types of shear failure – Bearing capacity of shallow foundation on homogeneous deposits - Methods: Terzaghi's ,Skempton's and BIS methods – Effect of water table on bearing capacity – Plate load test – Bearing capacity from in-situ tests - SPT, SCPT and plate load test methods of improving bearing capacity of soil.

Unit III	FOOTING, RAFT AND SETTLEMENT OF FOUNDATION	9 Hours

Types of foundation – contact pressure distribution below isolated footing – types and proportioning of combined footing – types and application of mat foundation – floating foundation – Settlement: total and differential settlements – causes and methods of minimizing settlement

Unit IV	DEEP FOUNDATION	9 Hours

capacity of single pile in cohesionless and cohesive soil – static formula – dynamic formulae (Engineering News and Hileys) – Capacity from in-situ tests (SPT and SCPT) – Negative skin friction – Carrying capacity of Pile group – Pile load test – Under-reamed piles – Introduction to well foundation and Diaphragm wall.

Unit V	EARTH PRESSURE AND STABILITY OF SLOPES	9 Hours

Earth pressure in soils: active and passive states – Lateral earth pressure Rankine's theory – stratified soil – Cullman's Graphical method –Slopes – Infinite and finite slopes – types of failure – causes of failure – Procedure for slip circle method and method of slices.

Total: 45 Hours

Further Reading:

To select suitable foundation for various soil condition.

Course Outcomes:

After completion of the course, Student will be able to

1.Illustrate the suitable techniques used for sub soil exploration.
2.Explain the type of foundation required for the given soil condition.
3.Select the dimensions of the foundation for various types of footing.
4.Interpret the load carrying capacity of piles.
5.Explain the stability analysis of retaining walls.

References:

1. Bowles .J.E, "Foundation analysis and design", McGraw Hill, 2001.
2.Murthy .V.N.S, "Textbook of Soil Mechanics and Foundation Engineering",CBS Publishers and Distributors, New Delhi, 2009.
3. Arora .K.R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2011.
4.Punmia .B.C, "Soil Mechanics and Foundations Engineering", Laxmi Publications Pvt.Ltd. New Delhi, 2005.
5.Das .B.M, "Principles of Foundation Engineering" (Fifth edition), Thomson Books, 2010

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1702CE551	COMPUTER AIDED BUILDING AND DRAWING LAB	L	T	P	C
		0	0	4	2

Course Objectives:

1. To develop skills in manual and AutoCAD drafting of building plans, elevation and sections
2. To understand the Functional Planning and architectural design of buildings and introduction to building physics.
3. To prepare detailed working drawing for doors, windows, etc.

List of Experiments:

1. Functional planning – Introduction to anthropometrics and ergonomics – Occupancy classification of Buildings –Essentials of National Building Code – Essentials of Building and development rules – Introduction to green building.
2. Building Physics : Sun's movement and building: Sun control devices –Exposed walls and Openings
3. Lighting and acoustics
4. Introduction to AutoCAD – Draw and modify tools- Dimensioning-Layers- Blocks-Printing- Two dimensional drawing 3D commands
5. Door, Windows, Ventilators.
6. Foundation, Staircase
7. Residential buildings – Plan, Section, Elevations
8. Public buildings like office, dispensary, post office, bank etc
9. Industrial buildings

Total: 45 Hours

Additional Experiments:

1. Commercial building like sky scrapers
2. Domed structures

Course Outcomes:

Employability

After completion of the course, Student will be able to

4. Ability to develop a concept drawing based on the requirements
5. Ability to draw Building Drawing as per planning authority requirement in AutoCAD.
6. Understand to draw plan, elevation and section of public and industrial structures
7. Apply the requirements to draw plan, elevation and section of load bearing and framed structures.
8. Analysis the building code and sun movements before drawing

References:

1. Sikka V. B., A Course in Civil Engineering Drawing, 4th Edition, S.K. Kataria and Sons, 1998.
2. George Omura, "Mastering in AUTOCAD 2002", BPB Publications, 2002
3. Verma.B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 1989.
4. A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc., 2008.
5. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2008.

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1702CE552	SURVEYCAMP	L	T	P	C
		0	0	4	1

Course Objectives:

1. Two weeks Survey Camp will be conducted during summer vacation in the following activities using Theodolite, cross staff, leveling staff, tapes, plane table and total station. The camp must involve work on a large area of not less than 400 hectares. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

List of Experiments:

1.Triangulation
2.Trilaterationand
3.Rectangulation
4.Alignment of Road survey
5.contouring (hill survey)

EVALUATION PROCEDURE

Internal Marks : 20 marks
(decided by the staff in-charge appointed by the Institution)

Evaluation of Survey Camp Report : 30 marks
2.(Evaluated by the external examiner appointed the University)

3. Viva voce examination : 50 marks
(evaluated by the internal examiner appointed by the HOD with the approval of HOI and external examiner appointed by the University – with equal Weightage

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. The camp must involve work on a large area of not less than 400 hectares
2. The camp record shall include all original field observations, calculations and plots.
3. Theodolite, cross staff, levelling staff, tapes, plane table and total station
4. Formation and extent of road

5.can able to design drainage and pipe networks.

References:

1.Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994
2. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
3. Punmia B.C. Surveying, Vols. I, II and III, Laxmi Publications, 1989

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1702CE553 **MINI PROJECT 1** **0 0 2 1**

Aim: To carry out a thematic design project in one of the specializations of civilengineering

Course Objectives:
To carry out a project this will make the students aware of the different facets of civil engineering

List of areas
1. Structural Engineering
2. Geotechnical Engineering
3. Water Resources Engineering

Course outcomes:

At the end of the course, the students will be able to

Structural Engineering

1.Prepare a structural lay out from architectural drawings Calculation loads Design of representative structural elements like slab, beam, columns, foundation etc.

2.Carry out testing in Strength of materials / concrete / structural labs

3.Learn any software and solving a problem using that.

Geotechnical Engineering Enhenpemship

1. Collect samples of soil and identification of their types Collection of literature on types of foundation Presentation of soil improvement techniques

2.Learn any software and solving a problem using that.

Water Resources And Environmental Engineering

1.Carry out population survey and working out water requirement. Preparation of a schematic diagram of water / wastewater treatment plants Assessment of quality of water / sewage by experiments Design of dock gates

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1704GE551 **LIFE SKILLS: APTITUDE – I** **L T P C**
0 0 2 1

Course Objective (s):

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

Course Outcomes:

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

Unit1	**Introduction to Number System, Basic Shortcuts of addition, Multiplication, Division**	
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 2	**Ratio and proportion, Averages**	
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 3	**Percentages, Profit And Loss**	
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 4	**Coding and decoding, Direction sense**	
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 5	**Number and letter series Number and Letter Analogies, Odd man out**	
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 letter Odd man out - Problems on verbal Odd man out		

TOTAL HOURS -- 30

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.
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.

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NAGAPATTINAM–611002

B.E. Civil Engineering

FullTime Curriculum and Syllabus

SEMESTER VI									
Course Code	Course Name	L	T	P	C	Maximum Marks			Category
						CIA	ES	Total	
Theory Course									
1702CE601	Structural Analysis II	3	2	0	4	40	60	100	PC
1702CE602	Concrete Structures II	3	0	0	3	40	60	100	PC
1702CE603	Design Of Steel Structures	3	0	0	3	40	60	100	PC
1702CE604	Water Supply Engineering	3	0	0	3	40	60	100	PC
1703CE009	Ground Water Engineering (Elective III)	3	0	0	3	40	60	100	PE
	Elective IV (Open)	3	0	0	3	40	60	100	PE
Laboratory Course									
1702CE651	Concrete And Highway Engineering Lab	0	0	2	1	50	50	100	PC
1702CE652	Environmental And Irrigation Design And Drawing	0	0	4	2	50	50	100	PC
1704GE651	Life Skills: Aptitude - II	0	0	2	1	100	0	100	EEC
1702CE653	Mini Project II	0	0	2	1	100	0	100	PC
1702CE654	Industrial Visit / Presentation	0	0	0	1	-	-	--	-
Total		**18**	**2**	**10**	**25**	**540**	**460**	**1000**	

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

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1702CE601	STRUCTURAL ANALYSIS II	L	T	P	C
		3	2	0	4

Course Objectives:

1.To obtain the ability to analyze indeterminate beams and rigid frames by Flexibility and Stiffness Matrix method.
2.To develop a clear understanding of Displacement functions in Structural element by Finite Element method.
3.To know the concept of plastic structures and analysis of space and Cable structures.

Unit I	MATRIX FLEXIBILITY METHOD	12 Hours

Equilibrium and compatibility- Determinate Vs indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

Unit II	STIFFNESS MATRIX METHOD	12 Hours

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames (with redundancy limited to two)

Unit III	PLASTIC ANALYSIS OF STRUCTURES	12 Hours

Statically indeterminate axial problems – beams in pure bending – Plastic hinge and mechanism –Plastic analysis of indeterminate beams and frames

Unit IV	INTRODUCTION TO FINITE ELEMENT ANALYSIS	12 Hours

Introduction- Steps involved in FEA – Displacement functions – truss element – beam element – Triangular elements.

Unit V	SPACE AND CABLE STRUCTURES	12 Hours

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – suspension bridges with two and three hinged stiffening girders.

Total:	45 + 15 Hours

Further Reading:

1. To analyze and find out the BMD.
2. To analyze the indeterminate structures.

Course Outcomes:

After completion of the course, Student will be able to
1.Analyze structures using matrix flexibility method.
2.Analyze structures using stiffness method.
3.Perform plastic analysis for indeterminate beams and frames.
4.Implement basic concepts of finite element analysis.
5.Analyze Space Truss using tension Coefficient method and beams curved in plan and cable suspension bridges.

References:

1.Punmia,B.C., Ashok Kumar and Arun Kumar Jain, " Theory of Structures", Laxmi Publications, 2005.
2. Vaidyanathan, R. and Perumal, P., "Comprehensive structural Analysis – Vol I & II", Laxmi Publications, New Delhi, 2003.
3. Negi L.S &Jangid R.S., "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 2003.
4.Ghali.A, Nebille, A.M. and Brown, T.G, "Structural Analysis" A unified classical and Matrix approach", 6th Edition, Spon Press, London and New York, 2013.
5.Gambhir, M.L., "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2011.
6.William Weaver Jr& James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers and Distributors, New Delhi, 2004

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1702CE602	CONCRETE STRUCTURES II	L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop an understanding on the basic concepts in the behavior and design of reinforced concrete structures such as Retaining Wall and counterfort retaining wall.
2. To provide knowledge on design of various components in the water tank by working stress method.
3. To provide knowledge on design of various reinforced concrete structures such as staircases, flat slabs and RC walls.
4. To expose the basic concepts about the yield line theory for the analysis and design of slab of various cross sections.
5. To expose the behavior of masonry structures, and be able to design for various loading conditions.

Unit I	RETAINING WALLS	9 Hours

Retaining walls - types - earth pressure - effects of surcharge - Stability requirements - Cantilever and counterfort retaining walls - detailing of reinforcement.

Unit II	WATER TANKS	9 Hours

R.C water tanks resting on ground - general design requirements – Overhead circular and rectangular tanks - Analysis and design using working stress method - detailing of reinforcement - codal provisions.

Unit III	STAIRS, FLAT SLABS AND WALLS	9 Hours

Staircases - Ordinary and Doglegged – Flat slabs - Direct design method – Reinforced concrete walls.

Unit IV	YIELD LINE THEORY	9 Hours

Yield line – Assumptions – Characteristics – Upper bound and lower bound theories - Yield line analysis - Design of slabs.

Unit V	BRICK MASONRY	9 Hours

Introduction - classification of walls - Lateral supports and stability - effective height of wall and columns - effective length of walls - Design loads, load dispersion - Permissible stresses - design of axially and eccentrically loaded brick walls

Total: 45 Hours

Further Reading :

1. Students can be able to work on retaining and storage structures
2. Students can be able to design shear walls, deck bridges.

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Design various types of retaining walls under various loading conditions
2. Design and detailing of different types of water tanks along with the staging and foundation.
3. Attain sufficient knowledge of design for staircases, flat slabs and reinforced concrete walls and gain knowledge about the principles of design of mat foundation, box culvert and road bridges
4. Apply the yield line theory for design of square, rectangular, circular and triangular slabs.
5. Design axially and eccentrically loaded brick walls based on the knowledge gained for various loading conditions

References:

1. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd, New Delhi 2007
2. Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford & IBH Publishing House, 1997.
3. UnnikrishnaPillai, S., DevdasMenon, "Reinforced Concrete Design".

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1702CE603	DESIGN OF STEEL STRUCTURES	L	T	P	C
		3	1	0	4

Course Objectives:

1.To learn the properties of steel sections and design basics and codal provisions- Design of connections
2.To design steel members subjected to tension and compression member.
3.Design steps involved in beams, built up beams and design of plate girder

Unit I	INTRODUCTION	9 +3Hours

Structural steel sections – Limit state design concepts - Connections- bolted and welded joints - Failure of joints - Efficiency of joints - Eccentric connections

Unit II	TENSION MEMBERS	9 +3Hours

Types of sections – Net area – net effective sections for angles and Tee in tension – Design of connections in tension members – use of lug angles – Design of tension splice – Concept of Shear lag.

Unit III	COMPRESSION MEMBERS	9 +3Hours

Effective length about major and minor principal axis - I.S code provisions- permissible stresses - Design rules- design of one component - two components and built up compression members under axial load- Design of Lacings and Battens - Different types of column bases - Slab base and Gusseted base - connection details

Unit IV	BEAMS	9 +3Hours

Design of laterally supported and unsupported beams – Built up beams – design of Plate Girders – Intermediate and bearing stiffeners – Web splicing.

Unit V	VINDUSTRIAL STRUCTURES	9 +3Hours

Design of roof trusses – Elements of roof trusses – Design of purlins – Estimation of wind loads – Design of gantry girders

	Total:	60 Hours

Further Reading Employability

Advanced steel structures / Composite steel structures

Course Outcomes: After completion of this course, students can able to

1.Explain the limit state design concept and design of bolted and welded connections.
2.Use the IS codal provisions to the design of tension members.
3.Use the IS codal provisions to the design of compression members
4.Apply the design principles in beams and plate girders.
5.Analysis various components involved in roof truss structures

References:

1. S.S. Bhavikatti ,"Design of Steel Structures", I. K. International Pvt Ltd, 2009.
2. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., "Design of Steel Structures", 3rd edition, McGraw-Hill Publications, 1992
3. Negi L.S." Design of Steel Structures", Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.

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1702CE604	WATER SUPPLY ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To examine the water supply system and conveyance system.
2. To create an ability to evaluate the water treatment and advanced water treatment system.
3. To train the students to analyze water distribution system and supply to buildings.

Unit I	PLANNING FOR WATER SUPPLY SYSTEM	08 Hours

Public water supply system -Planning -Design period - Population forecasting -Water demand -Sources of water and their characteristics -Surface and Groundwater- Impounding Reservoir Well hydraulics - Development and selection of source - Water quality - Characterization and standards.

Unit II	CONVEYANCE SYSTEM	07 Hours

Water supply -intake structures -Functions and drawings -Pipes and conduits for water- Pipe materials - Hydraulics of flow in pipes -Transmission main design – Materials of pipes- Laying, jointing and testing of pipes - Drawings appurtenances - Types and capacity of pumps -Selection of pumps and pipe materials.

Unit III	WATER TREATMENT	12 Hours

Objectives - Unit operations and processes - Principles, functions design and drawing of Screens, Flash mixers, flocculates, sedimentation tanks and sand filters - Disinfection- Residue Management.

Unit IV	ADVANCED WATER TREATMENT	09 Hours

Aerator - Iron and manganese removal, Defluoridation and demineralization -Water softening - Desalination - Membrane Systems-Construction and Operation & Maintenance aspects of Water Treatment Plants- Recent advances-Membrane processes.

Unit V	WATER DISTRIBUTION AND SUPPLY TO BUILDINGS	09 Hours

Requirements of water distribution -Components -Service reservoirs -Functions and drawings -Network design - Analysis of distribution networks –Pipe Appurtenances -operation and maintenance -Leak detection, Methods. Principles of design of water supply in buildings -House service connection -Fixtures and fittings - Systems of plumbing and drawings of types of plumbing.

	Total:	45 Hours

Further Reading:

1. Apply an appropriate unit system for the water treatment.
2. Estimate the quantity of wastewater and storm run-off generated from the town/ city and design a suitable collection system for the generated wastewater.

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Discuss about the principles and development of water supply system.
2. Design the pipelines for water supply system governed with head loss.
3. Design drawing of various unit operations in water supply system.
4. Identify the methods for removing contaminants in water treatment system using advanced techniques.
5. Interpret the network for water supply to buildings and House service connection.

References:

1. Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.
2. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.
3. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2005
4. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
5. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

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1703CE009	GROUND WATER ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1.To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers
2.Characteristicsofdifferentaquifers
3.To understand the techniques of development and management of groundwater
4.To be introduced to the different theories of traffic flow
5.To be aware of the importance of traffic safety

Unit I	HYDROGEOLOGICAL PARAMETERS	9 Hours

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties –permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation–Ground water table fluctuation and its interpretations – Groundwater development and Potential in India–GEC norms.

Unit II	WELLHYDRAULICS	9Hours

ObjectivesofGroundwaterhydraulics–Darcy'sLaw-Groundwaterequation–steadystate flow.DupuitForchheimerassumption-Unsteadystateflow-Theismethod-Jacobmethod-Slug tests – Image well theory –Partial penetrations of wells

Unit III	GROUNDWATER MANAGEMENT	9Hours

Need for Management Model – Database for groundwater management –groundwater balance study – Introduction to Mathematical model – Conjunctive use – Collector well and Infiltration gallery

Unit IV	GROUNDWATER QUALITY	9 Hours

Ground water chemistry - Origin, movement and quality - Water quality standards – Health and aesthetic aspects of water quality - Saline intrusion – Environmental concern and Regulatory requirements

Unit V	GROUNDWATER CONSERVATION	9 Hours

Artificial recharge techniques – Remediation of Saline intrusion– Ground water management studies – Protection zone delineation, Contamination source inventory, remediation schemes
- Ground water Pollution and legislation.

Total:	45 Hours

Further Reading:

1. Ground water to improving quality parameter
2. Water resource and hydrology for features need.

Course Outcomes: Employment

1. Students will be able to understand aquifer properties and its dynamics after the completionofthecourse.Itgivesanexposuretowardswelldesignandpracticalproblems of ground water aquifers
2. Studentswillbeabletounderstandtheimportanceofartificialrechargeandgroundwater quality concepts
3. Model regional ground water flow and design water wells
4.Estimatewaterqualityparameters
5.To safety ground water improvements of quality parameter

References:

1. Raghunath,H.M.,GroundWaterHydrology,WileyEasternLtd.,2000.
2. .ToddD.K.,GroundWaterHydrology,JohnWileyandSons,2000
3..VenT.Chow& David R. Maidment, Open Channel Flow, Tata McGraw-Hill Publishing Company, New Delhi, 1988
4.Walton, C, Applied Hydrology, Ground Water Resource Evaluation, McGraw-Hill Publications,1996
5.Karanth,GroundWaterAssessment,DevelopmentandManagement,TataMcGraw Hill,NewDelhi2006

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1702CE651	CONCRETE AND HIGHWAY ENGINEERING LAB	L	T	P	C
		0	0	4	2

Course Objectives:

1. This course provides an understanding of the basic properties of construction materials, and presents laboratory standards and testing requirements for these materials.
2. To familiarize the students to do the experiments as per the guidelines of BIS.
3. To develop an understanding of the highway materials and to obtain knowledge on properties of these materials.

List of Experiments:

1. Tests on cement
   1. Determination of specific gravity of cement.
   2. Determination of standard consistency of cement.
   3. Determination of initial and final setting times of cement.
   4. Determination of compressive strength of cement mortar.
2. Tests on aggregates
   1. Determination of Specific gravity and water absorption of fine & coarse aggregates.
   2. Determination of Fineness modulus of fine aggregate & coarse aggregate.
3. Tests on fresh and hardened concretes
   1. Determination of degree of workability: Slump cone test, Flow table, Compaction factor and Vee bee Consistometer
   2. Determination of Compressive strength of concrete
   3. Determination of Flexural strength of concrete
   4. Determination of Splitting tensile strength of concrete
4. Tests on Highway materials- Sub-grade material and Aggregates
   1. Crushing value test, impact value test, angularity test and abrasion test on aggregates.
   2. Marshall stability for bituminous mix
   3. Bitume extractor for b ituminous mix
5. Tests on Bitumen
   1. Penetration test and Ductility test.
   2. Flash point test and viscosity test.

Total: 45 Hours

Additional Experiments:

1. CBR test on the soil/ granular material.

Course Outcomes:

After completion of the course, Student will be able to

1. Evaluate the properties of cement
2. Understand the quality of aggregates used in concrete
3. Analyze the properties of fresh and hardened concrete
4. Knowledge gain about the highway materials
5. Evaluate the properties of bitumen

References:

1. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
2. Santhakumar,A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007
3. Gambir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
4. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998
5. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London,1995

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1702CE652	ENVIRONMENTAL AND IRRIGATION DESIGN AND DRAWING	L	T	P	C
		3	0	0	3

Course Objectives:

1.to know about the design of environmental structures
2.to know the pictorial representation of irrigation structures

Unit I	WATER SUPPLY AND TREATMENT	08 Hours

Design & Drawing of flash mixer, flocculator, clarifier – Slow sand filter – Rapid sand filter – Infiltration gallery – Intake towers – Service reservoirs – Pumping station – House service connection for water supply and drainage.

Unit II	SEWAGE TREATMENT & DISPOSAL	07 Hours

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process – Aeration tank & oxidation ditch – Trickling filters – Secondary clarifiers – Sludge digester – Sludge drying beds – Waste stabilisation ponds - Septic tanks and disposal arrangements – Manholes.

Unit III	IMPOUNDING STRUCTURES	12 Hours

Gravity dam, Tank Surplus Weir, Tank Sluice with tower road – Drawing showing plan, elevation, half section including foundation details.

Unit IV	CANAL TRANSMISSION STRUCTURES	09 Hours

Aqueducts – Syphon Aqueducts – Super passage – Canal siphon – Canal Drops- Drawing showing plan, elevation and foundation details.

Unit V	CANAL REGULATION STRUCTURES	09 Hours

Canal head works- Canal Regular – Canal escape- Proportional Distributors – Drawing showing detailed plan, elevation and foundation.

Total: 45 Hours

Further Reading:

1.to analyse and draw advanced irrigation and environmental structures

Course Outcomes:

After completion of the course, Student will be able to
1.design environmental treatment system
2. design the irrigation impounding structures
3. design the canal transmission structures
4. design the canal regulation structures

References:

1.Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.
2.Sathyanarayana Murthy "Irrigation Design and Drawing" Published by MrsL.Banumathi, Tuni east Godavari District. A.P. 1998
3.Sharma R.K. Irrigation Engineering and Hydraulic Structures Oxford and IBH Publishing co., New Delhi 2002.
4.Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.
5.Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2005
6.Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
7.Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

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1704CE653 **MINI PROJECT II** **0 0 2 1**

Aim: To carry out a thematic design project in one of the specializations of civil engineering

Course Objectives:

The student should be made to:

To carry out a project which will make the students aware of the different facets of civil engineering

List of areas

1.Geomatics Engineering

2.Construction management

3. Transportation engineering

Course outcomes:

At the end of course, the students will be able to

Geomatics Engineering and Surveying

Prepare central line diagram of buildings and laying out at site Establishment ofreduced levels of important points in an area Preparing the layout of a small area by means of compass / theodelite surveying Preparing LS / CS of an alignment..

Construction management

Prepare functional drawings for an occupancy Estimation of building components (using MS Excel) Preparation of work schedule using bar chart Preparation of paper on modern construction techniques

Transportation engineering

Carry out objective oriented traffic survey Carrying out surveys on bus routes – stopping time, ticketing time etc. Carrying out testing of highway making materials Preparation of schematic intersection layouts, grade separators etc.

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1704CE654 **INDUSTRIAL VISIT PRESENTATION** **0 0 2 1**

Entrepreneurship

In order to provide the experiential learning to the students, shall take efforts to arrange at least two industrial visit / field visits in a year. A presentation based on Industrial visits shall be made in this semester and suitable credit may be awarded.

Internal Assessment Only	
Test	40
Presentation / Quiz / Group Discussion	40
Report	20
Grades (Excellent / Good / Satisfactory / Not Satisfactory)	

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1704GE651 **LIFE SKILLS: APTITUDE II** **L T P C**

0 0 2 1

Course Objective (s):

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

Course Outcomes:

- Solve problems on Partnership, Mixture & Allegation and ages least time using shortcuts and apply real life situations.
- 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.
- Learners should be able to understand various charts and interpreted data least time.
- Workout puzzles, ability to arrange things in an orderly fashion.

Unit 1	**Partnership, Mixtures and Allegations, Problem on Ages, Simple Interest, Compound Interest**	
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 - Definition and formula for amount in compound interest - Difference between simple interest and compound interest for 2 years on the same principle and time period.		
Unit 2	**Blood relations, , Clocks, Calendars**	
Defining the various relations among the members of a family - Solving Blood Relation puzzles - Solving the problems on Blood Relations using symbols and notations - Finding the angle when the time is given - Finding the time when the angle is known - Relation between Angle, Minutes and Hours - Exceptional cases in clocks - Definition of a Leap Year - Finding the number of Odd days - Framing the year code for centuries - Finding the day of any random calendar date .		
Unit 3	**Time and Distance, Time and Work**	
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 - Problems on races - Problems on Unitary method - Relation between Men, Days, Hours and Work - Problems on Man-Day-Hours method - Problems on alternate days - Problems on Pipes and Cisterns.		
Unit 4	**Data Interpretation and Data Sufficiency**	
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		
Unit 5	**Analytical and Critical Reasoning**	
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 .		

TOTAL HOURS – 30

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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.
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.

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„A"Grade|Accredited byNBA (CSE, EEE, MECH, ECE,
CIVIL, IT)

NAGAPATTINAM–611002

B.E. Civil Engineering

FullTime Curriculum and Syllabus

SEMESTER VII									
Course Code	Course Name	L	T	P	C	Maximum Marks			Category
						CIA	ES	Total	
Theory Course									
1702CE701	Quantity Surveying & Cost Estimation	3	0	0	3	40	60	100	PC
1702CE702	Waste Water Engineering	3	0	0	3	40	60	100	PC
1702CE703	Structural Dynamics and Earth Quake Engineering	3	0	0	3	40	60	100	PC
1701MGX01	Professional Ethics	3	0	0	3	40	60	100	HS
1703CE015	Pre-Stressed Concrete (Elective V)	3	0	0	3	40	60	100	PE
	Elective VI (Open)	3	0	0	3	40	60	100	PE
Laboratory Course									
1702CE751	Computer Aided Design and Drafting Lab	0	0	4	2	50	50	100	PC
1702CE752	Water And Waste Water Engineering Lab	0	0	2	1	50	50	100	PC
1702CE753	Mini Project III	0	0	2	1	100	0	100	PC
1704GE751	Competitive exams Preparation	2	0	0	2	100	0	100	EEC
1702CE754	In plant Training / Internship Presentation	0	0	0	1	-	-	-	-
Total		**21**	**0**	**10**	**25**	**540**	**460**	**1000**	**-**

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1702CE701	QUANTITY SURVEYING & COST ESTIMATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To provide the student with the ability to estimate the quantities of item of works involved in buildings
2. To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works
3. To understand the techniques of development and management of groundwater
4. To be introduced to the different theories of traffic flow
5. To be aware of the importance of traffic safety

Unit I — **Procedure of estimation quantity** — **9 Hours**

Introduction– Estimate–Types of Estimates–Units of measurements–Methods of building estimate– calculation of quantities of earthwork, stone masonry, brick masonry, plastering, cement concrete, R.C.C, PCC Doors, Windows, Flooring, White Washing, colour washing and painting Nourishing for load bearing structures and framed structures.

Unit II — **ESTIMATE OF OTHER STRUCTURES** — **9Hours**

Estimating of septic tank, soakpit–sanitary and water supply installations–water supply pipeline–sewer line–tube well–open well–estimate of bituminous and cement concrete roads–estimate of retaining walls–culverts–estimating of irrigation works–aqueduct, syphon, fall

Unit III — **SPECIFICATION AND TENDERS** — **9Hours**

Data–Schedule of rates–Analysis of rates–Specifications–sources– Preparation of detailed and general specifications – Tenders – TTT Act – e-tender– Preparation of Tender Notice and Document–Contracts–Types of contracts–Drafting of contract documents–Arbitration and legal requirements

Unit IV — **VALUATION** — **9 Hours**

Necessity–Basics of value engineering –Capitalised value –Depreciation–Escalation– Value of building– Calculation of Standard rent –Mortgage–Lease

Unit V — **REPORT PREPARATION** — **9 Hours**

Principles for report preparation–report on estimate of residential building–Culvert–Roads – Water supply and sanitary installations–Tubewells– Openwells.

Total: 45 Hours

Further Reading:

1. Effective cost of good quality of building in civil engineering world.
2. Estimation of bridge ,road,culvert and other special structure using some software

Course Outcomes:

1. The student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student shall be able to prepare value estimates.
2. To know the importance of preparing the types of estimates under different conditions
3. To apply logical thoughts and prepare the rate analysis and bills
4. To analyze and synthesize cost effective approach for civil engineering projects
5. To comprehend detailed report on estimation and valuation process

References:

1. Dutta, B.N., Estimating And Costing, S Dutta & Co., Lucknow 2006.
2. .Rangawala, S.C., Estimating And Costing, Charotar Anand Publications, 1996
3. .Kohli, D.D. And Kohli R.C., A Text Book On Estimating, Costing And Accounts, S.Chand And Co, New Delhi, 1994
4. Cpwd Specifications And Schedule Of Rates

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1702CE702	WASTE WATER ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the importance of planning and design of sewerage system.
2. To create an ability to evaluate the waste water treatment system.
3. To impart the signification of disposal of Sewage.

Unit I **PLANNING FOR SEWERAGE SYSTEMS** **09 Hours**

Sources of wastewater generation – Effects – Estimation of sanitary sewage flow – Estimation of storm runoff – Factors affecting Characteristics and composition of sewage and their significance – Effluent standards – Legislation requirements.

Unit II **DESIGN OF SEWER** **09 Hours**

Sewerage – Hydraulics of flow in sewers – Design period - Design of sanitary and storm sewers – Small bore systems – Materials of sewers– Laying, joining & testing of sewers – Forces acting on sewers– Cleaning and maintenances of sewers- Sewer appurtenances – Pumps – selection of pumps and pipe Drainage -. Plumbing System for Buildings – One pipe and two pipe system.

Unit III **PRIMARY TREATMENT OF SEWAGE** **09 Hours**

Objective – Unit Operation and Processes – Selection of treatment processes – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Operation and Maintenance aspects – Onsite sanitation - Septic tank, Grey water harvesting.

Unit IV **SECONDARY TREATMENT OF SEWAGE** **09 Hours**

Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units - Activated Sludge Process and Trickling filter, other treatment methods – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment – Construction and Operation & Maintenance of Sewage Treatment Plants.

Unit V **DISPOSAL OF SEWAGE AND SLUDGE** **09 Hours**

Standards for Disposal - Methods – dilution – Self-purification of surface water bodies – Oxygen sag curve – Land disposal – Sewage farming – Deep well injection – Soil dispersion system -Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

Total: 45 Hours

Further Reading:

1. Design the necessary treatment units for energy conservation.
2. Design the suitable disposal unit for the sludge without endangering the environment.

Course Outcomes:

After completion of the course, Student will be able to

1. Examine the waste water quality characteristics and standards.
2. Design sewerage systems and discuss about the treatment process step by step done in primary level.
3. Design the various unit operations for waste water treatment.
4. Design the sludge treatment and disposal methods.
5. Perform quality analysis of sewage the characteristics and composition of sewage, self - Purification of streams.

References:

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2003.
2. Punmia, B.C., Jain, A.K., and Jain.A., Environmental Engineering, Vol.II, Lakshmi Publications, Newsletter, 2005
3. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1997.
4. Wastewater Engineering – Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2003.

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1702CE703	STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1.To introduce dynamic loading and the dynamicperformance of the structures to the students. Different types of dynamic loading also tobe discussed.

2.The detailed study on the performance of structures under earthquake loading is also one of the focus of the course.

Unit I	**PRINCIPLES OF VIBRATION ANALYSIS**	**9 Hours**

Mathematical models of single degree of freedom systems - Free and forced vibration of SDOF systems, Response of SDOF to special forms of excitation, Effect of damping, Transmissibility.

Unit II	**MULTIPLE DEGREE OF FREEDOM SYSTEM**	**9 Hours**

Two degree of freedom system – Normal modes of vibration – Natural frequencies - Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

Unit III	**ELEMENTS OF EARTHQUAKE ENGINEERING**	**9 Hours**

Earthquake magnitude and intensity Focus and Epicentre, Causes and Effects of Earthquakes, Characteristics of Earthquake, Seismic zone mapping– Spectral Acceleration.

Unit IV	**DESIGN SEISMIC FORCES**	**9 Hours**

Codal provision for design - IS 1893-2002 – Response spectrum – determination of lateral forces – base shear – by response spectrum method for 2 storey moment resistant frame- calculation of drift Aspects in planning and layout - regular and irregular buildings- calculation of centre of mass and centre of rigidity for simple layouts- eccentricity and torsion.

Unit V	**Ductile Detailing**	**9 Hours**

Ductility of R.C structures- Confinement- detailing as per IS-13920-1993- moment redistribution – principles of design of beams, columns – beam column joints – soft story concept. Base Isolation: Isolation systems – Effectiveness of base isolation.

Total:	**45 Hours**

Further Reading: At the end of the course,

1. Analyse structures subjected to dynamic loading.
2. Design the structures for seismic loading as per code provisions.

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Analyze single degree of freedom systems without damping and with damping
2. Analyse multi degree freedom system and continuous systems using iterative techniques.
3. Knowledge on earthquakes and Effects of Earthquakes
4. Knowledge on earthquakes and its resistant features for different types of buildings
5. Determine the design lateral forces by means of codal provisions.

References:

1. PankajAgarwal, "Earthquake Resistant Design of Structures" PHI Learning Private Limited, New Delhi, 2010.
2. Chopra. AK, "Dynamics of Structures – Theory and Applications to Earthquake Engineering" Second Edition, Pearson Education, 2003
3. SK.Duggal,"Earthquake Resistant Design of Structures", Oxford University Press, New Delhi, 2010
4. "Learning earthquake Design and Construction", Earthquake Tips 1 to 24, Authored by C.V.R. Murthy, IIT, Kanpur. eqtips@iitk.ac.in Web sites: www.nicee.org.
5. IS 1893: 2001, (Part I) "Criteria for Earthquake Resistant Design of Structures - Part 1: General Provisions and Buildings", BIS, 2002.

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1701MGX01	PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3

Course Objectives:

1.The primary goal is to stimulate critical and responsible reflection on moral issues surrounding engineering practice and to provide the conceptual tools necessary for pursuing those issues.
2.Also to make the students aware of the different ethical issues, codes of conduct for engineers in the society and moralities in an organization.

Unit I	INTRODUCTION & HUMAN VALUES	9 Hours

Morals, Values and Ethics- Work Ethic - Team work – Types of Ethics - Respect for Others- Living Peacefully- Honesty- Courage - Valuing Time - Co-operation - Commitment- Self-Confidence - Customs and religion-Caring and Sharing.

Unit II	ENGINEERING ETHICS	9 Hours

Engineering ethics – Variety of moral issues – Types of Inquiry – Professional accountability – Self Interest – Moral dilemmas – Kohlberg's Theory – Gilligan's Theory – Theories about Right Action – Ethical codes of IEEE and Institution of Engineers.

Unit III	SAFETY & RESPONSIBILITY OF ENGINEERS	10 Hours

Engineering as experimentation – Safety and Risks – Risk – benefit analysis – Computer Technology Privacy – Social Policy – Engineering standards – Communicating Risk and Public Policy – Occupational Crime – Professional Rights and Employee Rights – Whistle Blowing – Collective Bargaining – Conflicts of Interest.

Unit IV	ENGINEER'S ROLE	9 Hours

Engineers as Managers, Advisors, Consultants, Experts and Witness – Engineers role in industry and society – Theories about right action – Moral leadership - Collegiality and loyalty – IPR – Discrimination - Bhopal gas tragedy case study.

Unit V	GLOBAL ISSUES	8 Hours

Multinational corporations-Environmental Ethics- Weapons Development- Code of Conduct – Eco – friendly production system – Sustainable technology & development – ozone depletion – Eco system – Pollution control.

	Total:	45 Hours

Further Proceeding:

1. Analysis about Safety and Risk Management in an Organisation
2. Analysis about Code of Conduct for Ethical & Moral values

Course Outcomes: Skilled

After completion of the course, Student will be able to

3. Obtain awareness on Human Values & Social Values of the every individual.
4. Knowledge about ethical theories and relevant code of conduct for engineers.
5. Enumerate the safety and responsibility of engineers in the society.
6. Realize their responsibilities, professional rights and moralities for the enhancement of an organization.
7. Explain about the environmental impacts at present day scenario.

References:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey,2004 (Indian Reprint now available)
3. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available).
4. John R Boatright, "Ethics and the conduct of business", Pearson Education, New Delhi,2003.

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1702CE751	COMPUTER AIDED DESIGN AND DRAFTING LAB B.E CIVIL ENGINEERING	L	T	P	C
		0	0	4	2

Course Objectives:

1. To learn the software developing skills for structural design
2. To understand the computing skills in the field of geotechnical engineering.
3. To study the different software packages for analysis and design

List of Experiments:

1. Design of building elements (RC)-Standard method of detailing RC beams, slabs and columns – Special requirements of detailing with reference to erection process.
2. Design of Industrial Buildings - Steel roof trusses
3. Design of Overhead water tanks (RC & Steel)
4. Design of box culvert and slab bridges
5. Design of steel chimneys

Total: 45 Hours

Additional Experiments:

1. Transportation planning process- Trip generation and distribution- Network analysis - Shortest path algorithms
2. Water resources - Pipe networks - Canal design - Backwater profile - Synthetic derivation of stream flows using random numbers - Dam stability

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Learn software developing skills for structural design
2. Study the different software packages for analysis and design
3. Use computer software to model any type of structure
4. Compute loads and use computer software to analyse a structure
5. Use computer software to design a structure based on is codal provisions.

References:

1. Krishna Raju N, "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2003.
2. Krishna Raju N, Structural Design and Drawing (Reinforced Concrete and Steel). University press, Hyderabad, 2006
3. Krishnamoorthy, C.S. and Rajeev, S., Computer Aided Design and Analytical Tools, Narosa, 1993.
4. Papacostas, C.S., Fundamentals of Transportation Engineering Prentice-Hall of India, 2001
5. Loucks, D.P., Stedinger, J.R. and Haith, D.A., Water Resource Systems Planning and Analysis, Prentice-Hall INC, 1981.

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1702CE752	WATER AND WASTE WATER ENGINEERING LAB B.E CIVIL ENGINEERING	L	T	P	C
		0	0	4	2

Course Objectives:

1. To know the basics, importance of water and wastewater treatment and methods measurement.
2. To study the various effects of water and waste water pollution.
3. Effect of BOD and COD
4. To find Calcium, Potassium and Sodium
5. Heavy metal effects and finding methods

List of experiments

1. Determination of Ammonia Nitrogen in waste water.
2. CoagulationandPrecipitationprocessfor treating waste water
3. Determination of suspended, volatile fixed and settles able solids in wastewater.
4. B.O.D. test
5. C.O.D. test
6. Nitrate in wastewater
7. Phosphate in wastewater
8. Determination of Calcium, Potassium and Sodium
9. Heavy metals determination-Chromium, Lead and Zinc. (Demonstration only)

Total: 45 Hours

Additional Experiments:

1. conductivity meter
2. UASB Reacter

Course Outcomes:

After completion of the course, Student will be able to

1. characterize given water and waste water sample
2. perform filtration techniques and methods
3. characterize hazardous and non-hazardous substances

References:

1. Standard methods for the examination of water and wastewater, APHA, 20th Edition, Washington, 1998
2. Garg, S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi
3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6

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1704CE753 **MINI PROJECT III** **0 0 2 1**

Aim:

To carry out a design project in one of the specializations of civil engineering withsubstantial multidisciplinary component

Course Objectives:

The student should be made to:

To guide the students in such a way so that they carry out a work on a topic as a forerunner to the full fledged project work to be taken subsequently in VIII semester. The project work shall consist of substantial multidisciplinary component

List of Experiments:

The students will carry out a project in one of the following civil engineering areasbut with substantial multidisciplinary component involving Architecture,Mechanical engg. Electrical engg., Biotechnology, Chemical engg., Computerscience.

1. Structural Engineering
2. Geotechnical Engineering
3. Water Resources engineering and environmental engg.
4. Geomatics Engineering and surveying
5. Construction management
6. Transportation engineering

Internship

Student groups will be formed (6 in a group) and a faculty member will be allocated to guide them. There will be three reviews. First review will not carry any marks but the project topic will be finalized in it. Of remaining 2 reviews one will be carried out in the mid-semester and the last one by the end of semester.

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1704GE751 BE PREPARED TO ACE THE TECHNICAL SKILLS IN COMPETITIVE EXAMS **2 0 0 2**

Course Objectives

The students should be made to:

1. Study the concepts of concrete structures, design and analysis.
2. Study the process and implementation of surveying,geotechnical engineering.
3. Familiar with the construction materials, management and waste water engineering

Employability

Total: 30 Periods

BUILDING MATERIALS : brick, stones, aggregates, cement,Timber

CONSTRUCTION PRACTICES: Construction of stone masonry, brick masonry and R.C.C. and block masonry– construction equipments.

ENGINEERING SURVEY: Survey - computation of areas - Chain Survey - Compass surveying - Plane table survey –levelling

STRENGTH OF MATERIALS: Stresses and strains -Thermal stresses- elastic constants - Beams and bending – Bending moment and shear force in beams

STRUCTURAL ANALYSIS: Indeterminate beams - Stiffness and flexibility methods of structural analysis – Slope deflection - Moment Distribution method – Arches and suspension cables

GEOTECHNICAL ENGINEERING: Formation of soils - types of soils - classification of soils for engineering practice – Field identification of soils - Physical properties of soils - Three phase diagram-Soil exploration - Soil sampling techniques -Borelog profile - shallow foundations

ENVIRONMENTAL ENGINEERING: Sources of water - Ground water Hydraulics - Characteristics of water - Water analysis -water treatment - water borne diseases. Sewerage system

DESIGN OF REINFORCED CONCRETE: Design of concrete members - limit state and working stress design concepts - design of slabs - one way, two way and flat slabs

HYDRAULICS: Hydrostatics-applications of Bernoulli equation – flow measurement in channels, Applications of Momentum equation, Kinematics of flow.

TRANSPORTATION ENGINEERING: Different modes of transport and their characteristics. Geometric design of highways. –Design and Construction of bituminous and concrete roads – Maintenance of roads.

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1704GE754 IN-PLANT TRAINING / INTERNSHIP PRESENTATION 0 0 2 1

In order to provide the experiential learning to the students, the students undergo in-plant training or internship during summer / winter vacation between III and VII semesters. A presentation based on in-plant training / internship shall be made in this semester and suitable credit may be awarded.

Internship

Internal Assessment Only	
Test	40
Presentation / Quiz / Group Discussion	40
Report	20
Grades (Excellent / Good / Satisfactory / Not Satisfactory)	

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NAGAPATTINAM–611002

B.E. Civil Engineering

FullTime Curriculum and Syllabus

SEMESTER VIII									
Course Code	Course Name	L	T	P	C	Maximum Marks			Category
						CIA	ES	Total	
Theory Course									
1703CE019	Storage And Industrial Structures (Elective VII)	3	0	0	3	40	60	100	PE
1703CE021	Repair And Rehabilitation of Structures (Elective VIII)	3	0	0	3	40	60	100	PE
1703CE025	Traffic Engineering and Management (Elective IX)	3	0	0	3	40	60	100	PE
Laboratory Course									
1702CE851	Project	0	0	18	9	50	50	100	PC
Total		**09**	**0**	**18**	**18**	**170**	**230**	**400**	-

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1703CE019	STORAGE AND INDUSTRIAL STRUCTURES B.E CIVIL ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To study the design of material storage structures
2. To study the design procedures and practices of complex steel structures like industrial structures and Gantry girders.
3. To develop an in-depth knowledge in the area of design of industrial structure with the latest code of practice as per the Indian Standard

Unit I	PLANNING AND LAYOUT	9 Hours

Planning and layout of low-rise buildings for different functions such as residences, office buildings, shopping centers, hospitals, auditoria, etc. STEEL MILL BUILDINGS: Planning the general framing scheme - Planning the Trusses - Bracing of roofs - Vertical bracing of buildings - Design of roof Trusses and lattice girders

Unit II	DESIGN OF FRAMES	9 Hours

Design of simple and rigid frames – Gable frames – Knee bents

Unit III	DESIGN OF CHIMNEYS	9 Hours

Self-supporting - Guyed Chimneys - Design of towers

Unit IV	INDUSTRIAL ROOFING STRUCTURES	9 Hours

Trusses – Design of lattice girders – design of arches – Plate girders - Design of industrial sheds - Design of over head and under slung girders - Gantry girder - Design of gantry columns – Heavy duty plate girders.

Unit V	BUNKERS AND SILOS:	12 Hours

Pressure on side walls of bunkers and silos - Janssen's and Airy's theories - Complete design of single cell circular silos including their supporting structures and foundation - Design of rectangular and square bunkers - sloping bottom - design of staging.

	Total:	45 + 15 Hours

Further Reading:

design concrete and steel material storage structures.

Course Outcomes:

After completion of the course, Student will be able to

1. Discuss the planning and functional requirements of Industrial structures.
2. Discover the need to learn about the design concepts, and constructional aspects of Industrial structures
3. Design of Simple Industrial shed-gantry girder
4. Design steel gantry girders and portal frames
5. Design storage structures, bunkers and silos

References:

1. Dunham C W, "Planning Industrial Structures", McGraw Hill Book Company, Inc., 1980.
2. Subramanian N," Design of Steel Structures", Oxford University Press, NewDelhi 2008
3. Jayagopal L S, 'Structural Steel Design", Vikas Publications, 2012
4. Gaylord and Gaylord," Structural Engineering Hand Book", McGraw Hill book Co., 1990
5. Charles G Salmon & John E Johnson, "Steel Structures – Design & Behaviour", Harper Collins Publishers, 3rd edition, 1990.
6. Robert Englekirk, "Steel Structures, Controlling Behaviour through Design", John Wiley & Sons, Inc., 2003.
7. Ram Chandra, "Design of Steel Structures", Vol.2, Scientific Publication (India), Jodhpur, 2007

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1703CE021	REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	C
		3	0	0	3

Course Objectives:

1.To make the students to gain knowledge on quality of concrete ,durability aspects, causes of deterioration, assessment of distressed structures ,repairing of structures and demolition procedures.
2. To make the students to assess the durability of concrete due to various climate conditions
3.To prepare the students to select the appropriate rehabilitation, retrofitting and demolition for structures

Unit I	MAINTENANCE AND REPAIR STRATEGIES	9 Hours

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration

Unit II	STRENGTH AND DURABILITY OF CONCRETE	9 Hours

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness

Unit III	SPECIAL CONCRETES	9 Hours

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

Unit IV	TECHNIQUES FOR REPAIR AND PROTECTION METHODS	9 Hours

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection

Unit V	REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES	12 Hours

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques - Engineered demolition methods - Case studies.

	Total:	45 + 15 Hours

Course Outcomes:

After completion of the course, Student will be able to

1. Suggest maintenance and repair strategies
2. Examine the durability due to various climate conditions
3. Suggest the suitable materials and techniques for repair
4. Choose various rehabilitation and retrofitting techniques.
5. Select suitable demolition techniques for structures.

References:

1. 1.Shetty M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008
2. DovKominetzky.M.S., " Design and Construction Failures", Galgotia Publications Pvt.Ltd., 2001
3. Ravishankar.K., Krishnamoorthy.T.S, " Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
4. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
5. Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013

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1703CE025		TRAFFIC ENGINEERING AND MANAGEMENT	L	T	P	C
			3	0	0	3

Course Objectives:

- To learn the fundamentals of traffic engineering
- To learn the methods of intersection design
- To learn the skills of traffic control
- To be introduced to the different theories of traffic flow
- To be aware of the importance of traffic safety

Unit I — **TRAFFIC PLANNINGAND CHARACTERISTICS** — **9 Hours**

RoadCharacteristics– Roadusercharacteristics–PIEVtheory–Vehicle–Performance characteristics–FundamentalsofTrafficFlow–UrbanTrafficproblemsinIndia–Integrated planningoftown,country,regionalandallurbaninfrastructure–TowardsSustainableapproach.

Unit II — **TRAFFIC SURVEYS AND TRAFFIC DESIGN** — **10 Hours**

Traffic Surveys–Speed, journeytimeanddelaysurveys–VehiclesVolumeSurveyincludingnon-motorizedtransports–Methodsandinterpretation–OriginDestinationSurvey IntersectionDesign-channelization,Rotaryintersectiondesign–Signaldesign–Coordination of signals—Gradeseparation

Unit III — **TRAFFIC SAFETYANDENVIRONMENT** — **8 Hours**

Roadaccidents–Causes,effect,prevention,andcost–Streetlighting– Trafficandenvironment hazards–AirandNoisePollution,causes, abatementmeasures–Promotionandintegrationof public transportation–Promotionofnon-motorizedtransport.

Unit IV — **ROADSAFETY AND RULES** — **9 Hours**

Road Safety Audit - Global & Local perspective – Road safety issues – Road safety programmes – Types of RSA, planning, design, construction & operation stage audits – Methodology – Road safety audit measures

Unit V — **Traffic System Management** — **9 Hours**

Traffic System Management- Management techniques, one-way, tidal flow, turning restrictions etc. – Transportation System Management Process – TSM Planning & Strategies

Total: 45 Hours

Course Outcomes:

After completion of the course, Student will be able to

1. Carry out traffic studies
2. Design intersections
3. Implement traffic system management
4. Be aware of traffic flow theory
5. Enhance safety in all design aspects

References:

1. *Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, 2012*
2. *Khisty C J,LallB.Kent; Transportation Engineering-An Introduction, Prentice-Hall,NJ, 2005*
3. *May, A.D., Traffic Flow Fundamentals, Prentice – Hall, Inc., New Jersey,1990*

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1704CE851 **PROJECT WORK** **0 0 18 9**

Course Objectives:

To guide the students such a way that the they carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations. The project work so chosen by the student shall culminate in gaining of major design experience in the related area of specialization.

Course Outcomes (COs)

Upon completion of the course, the student should be able to,

a) Formulate a real world problem, identify the requirement and develop the design solutions.
b) Express the technical ideas, strategies and methodologies of civil engineering.
c) Utilize the new tools,softwares and techniques that contribute to obtain the solution of the project.
d) Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
e) Prepare report and present the oral demonstrations.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Total: 180 Periods

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NAGAPATTINAM – 611 002

M.E. ENVIRONMENTAL ENGINEERING

Full Time Curriculum and Syllabus

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701EV101	Statistics For Environmental Engineers	3	2	0	4	40	60	100
1702EV102	Environmental Chemistry	3	0	0	3	40	60	100
1702EV103	Environmental Microbiology	3	0	0	3	40	60	100
1702EV104	Transport of Water and Waste Water	3	0	0	3	40	60	100
1702EV105	Principles and Design of Physico-Chemical Treatment Systems	3	0	0	3	40	60	100
	Elective-I	3	0	0	3	40	60	100
Laboratory Course								
1704EV106	Environmental Chemistry Laboratory	0	0	2	1	50	50	100
1704EV107	Environmental Microbiology Laboratory	0	0	2	1	50	50	100
1704EV108	Communication Skills Lab I	0	0	2	1	100	0	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701EV101	STATISTICS FOR ENVIRONMENTAL ENGINEERS	L	T	P	C
		3	2	0	4

COURSE OBJECTIVES:

1. To introduce the basic concept of Stochastic Processes
2. To enable the students in handling Estimation and Testing of Hypothesis
3. To learn the Application of Statistics in Engineering Decision Making

UNIT I PROBABILITY AND RANDOM VARIABLE **9 + 3 Hours**

Probability concepts – Random Variables – Moment generating function – Standard distributions - Binomial - Poisson - rectangular or Uniform – Normal - Exponential distributions - Functions of random variables –Two dimensional random variables.

UNIT II STOCHASTIC PROCESSES **9 + 3 Hours**

Classification – Stationary and Random process – Markov process – Markov chains – Transition probability – Classification of Markov chain – Limiting distribution – First passage time – Poisson process – Birth and death process.

UNIT III ESTIMATION THEORY **9 + 3 Hours**

Estimation: Point and Interval estimates for population parameters of large sample and small samples, determining the sample size- unbiased Estimators- Maximum Likelihood Estimation-Curve Fitting by Principle of Least square

UNIT IV TESTING OF HYPOTHESIS- PARAMETRIC TESTS **9 + 3 Hours**

Hypothesis testing: one sample and two sample tests for means and proportions of large samples z-test, one sample and two sample tests for means of small sample t-test, F-test for two sample standard deviations. ANOVA one and two way classification.

UNIT V NON PARAMETRIC TESTS **9 + 3 Hours**

Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit. Sign test for paired data. Rank sum test. Comparing two populations. Mann – Whitney U test and Kruskal Wallis test.

TOTAL: 45 + 15 HOURS

COURSE OUTCOMES:

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

CO1: To acquire knowledge in basic concepts of Probability
CO2: To characterize phenomenon which evolve with respect to time in a probabilistic manner
CO3: To estimate the sample size and prediction of unknown values
CO4: To solve Parametric and non - parametric statistical problem
CO5: To apply statistical techniques for solving Engineering problems

REFERENCES:

1. Jay L. Devore, "Probability and Statistics For Engineering and the Sciences", Thomson and Duxbury, 2002.
2. Richard Johnson. "Miller & Freund's Probability and Statistics for Engineer", Prentice – Hall, Seventh Edition, 2007.
3. Gupta S.C. and Kapoor V.K."Fundamentals of Mathematical Statistics", Sultan an Sons, 2001.
4. Dallas E Johnson , "Applied Multivariate Methods for Data Analysis", Thomson an Duxbury press,1998.
5. Jay L. Devore, "Probability and Statistics For Engineering and the Sciences", Thomson and Duxbury, 2002.

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1702EV102	ENVIRONMENTAL CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To educate the students about water chemistry
2. To impart knowledge in the area of air and soil chemistry
3. To impart knowledge on the transformation of chemicals in the environment

UNIT I INTRODUCTION **9 Hours**

Stoichiometry and mass balance-Chemical equilibria, acid base, solubility product(Ksp) ,heavy metal precipitation, amphoteric hydroxides,CO_2 solubility in water and species distribution – Chemical kinetics , First order- 12 Principles of green chemistry.

UNIT II AQUATIC CHEMISTRY **11 Hours**

Water quality parameters- environmental significance and determination; Fate of chemicals in aquatic environment, volatilization, partitioning, hydrolysis, photochemical transformation– Degradation of synthetic chemicals-Metals, complex formation, oxidation and reduction , pE – pH diagrams, redox zones – sorption-Colloids, electrical properties, double layer theory, environmental significance of colloids, coagulation.

UNIT III ATMOSPHERIC CHEMISTRY **7 Hours**

Atmospheric structure —chemical and photochemical reactions – photochemical smog. Ozone layer depletion – greenhouse gases and global warming, CO2 capture and sequestration – Acid rain- origin and composition of particulates. Air quality parameters-effects and determination.

UNIT IV SOIL CHEMISTRY **9 Hours**

Nature and composition of soil-Clays- cation exchange capacity-acid base and ion-exchange reactions in soil – Agricultural chemicals in soil-Reclamation of contaminated land; salt by leaching-Heavy metals by electrokinetic remediation.

UNIT V ENVIRONMENTAL CHEMICALS **9 Hours**

Heavy metals-Chemical speciation –Speciation of Hg &As- Organic chemicals- Pesticides, Dioxins, PCBs, PAHs and endocrine disruptors and their Toxicity- Nano materials, CNT, titania, composites, environmental applications.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1: Solve environmental issues of chemicals based Pollution

CO2: Determine chemicals need calculations for treatment purpose

CO3: Identify contaminating chemicals

REFERENCES:

1. Sawyer,C.N., MacCarty, P.L. and Parkin, G.F., Chemistry for Environmental Engineering and
2. Science, Tata McGraw – Hill, Fifth edition, New Delhi 2003.
3. Colin Baird „Environmental Chemistry", Freeman and company, New York, 1997.
4. Manahan, S.E., Environmental Chemistry, Eighth Edition, CRC press, 2005.
5. Ronbald A. Hites ,Elements of Environmental Chemistry, Wiley, 2007.

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1702EV103	ENVIRONMENTAL MICROBIOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To Understand the microbiology relevant to environmental engineering
2. The morphology, behavior and biochemistry of bacteria, fungi, protozoa, viruses, and algae
3. The microbiology of wastewater, sewage sludge and solid waste treatment processes
4. An exposure to toxicology due to industrial products and byproducts
5. Aspects on nutrient removal and the transmission of disease causing organisms

UNIT I CLASSIFICATION AND CHARACTERISTICS **5 Hours**

Classification of microorganisms – prokaryotic, eukaryotic, cell structure, characteristics, Preservation of microorganisms, DNA, RNA, replication, Recombinant DNA technology.

UNIT II MICROBES AND NUTRIENT CYCLES **10 Hours**

Distribution of microorganisms – Distribution / diversity of Microorganisms – fresh and marine, terrestrial – microbes in surface soil, Air – outdoor and Indoor, aerosols, biosafety in Laboratory – Extreme Environment – archaebacteria – Significance in water supplies – problems and control. Transmissible diseases. Biogeochemical cycles-----Hydrological - Nitrogen, Carbon, Phosphorus, Sulphur, Cycle – Role of Micro Organism in nutrient cycle.

UNIT III METABOLISM OF MICROORGANISMS **10 Hours**

Nutrition and metabolism in microorganisms, growth phases, carbohydrate, protein, lipid metabolism – respiration, aerobic and anaerobic-fermentation, glycolysis, Kreb"s cycle, hexose monophosphate pathway, electron transport system, oxidative phosphorylation, environmental factors, enzymes, Bioenergetics.

UNIT IV PATHOGENS IN WASTEWATER **10 Hours**

Introduction to Water Borne pathogens and Parasites and their effects on Human, Animal and Plant health, Transmission of pathogens – Bacterial, Viral, Protozoan, and Helminths, Indicator organisms of water – Coliforms- total coliforms, E-coli, Streptococcus, Clostridium, Concentration and detection of virus. Control of microorganisms; Microbiology of biological treatment processes – aerobic and anaerobic, □-oxidation, β-oxidation, nitrification and de-nitrification, eutrophication. Nutrients Removal – BOD, Nitrogen, Phosphate. Microbiology of Sewage Sludge.

UNIT V TOXICOLOGY **10 Hours**

Ecotoxicology – toxicants and toxicity, Factors influencing toxicity. Effects – acute, chronic, Test organisms – toxicity testing, Bioconcentration – Bioaccumulation, biomagnification, bioassay, biomonitoring, bioleaching.

TOTAL: 45 HOURS

COURSE OUTCOMES:

Employability

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

CO1: Understand the basics of microbiology and their diversity and on the genetic material in the living cell.

CO2: Understand and describe the type of microorganisms in the environment and the role of microorganisms in the cycling of nutrients in an ecosystem.

CO3: Understand the role microbial metabolism in a wastewater treatment plant.

CO4: Know the role of microorganisms in contaminated water and the diseases caused.

CO5: Conduct and test the toxicity due to various natural and synthetic products in the environment.

References:

1. S.C.Bhatia, Hand Book of Environmental Microbiology, Part 1 and 2, Atlantic Publisher
2. Gabriel Bitton, Wastewater Microbiology, 2nd Edition ,
3. Raina M. Maier, Ian L. Pepper, Charles P. Gerba, Environmental Microbiology, Academic Press.
4. SVS. Rana, Essentials of Ecology and Environmental Science, 3rd Edition, Prentice Hall of India Private Limited
5. Stanley E. Manahan, Environmental Science and Technology, Lewis Publishers.
6. Hurst, C.J. (2002) Manual of Environmental Microbiology. 2nd Ed. ASM PRESS, Washington, D.C. ISBN 1-55581 - 199 - X.
7. Frank C. Lu and Sam Kacew, LU"s Basic Toxicology, Taylor & Francis, London (4th Ed), 2002

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1702EV104	TRANSPORT OF WATER AND WASTEWATER	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To educate the students in detailed design concepts related to water transmission mains, water distribution system, sewer networks and storm water drain
2. To educate the students in computer application on design.

UNIT I GENERAL HYDRAULICS AND FLOW MEASUREMENT **8 Hours**

Fluid properties; fluid flow – continuity principle, energy principle and momentum principle; frictional head loss in free and pressure flow, minor heads losses, Carrying Capacity–Flow measurement.

UNIT II WATER TRANSMISSION AND DISTRIBUTION **10 Hours**

Need for Transport of water and wastewater-Planning of Water System –Selection of pipe materials, Water transmission main design- gravity and pumping main; Selection of Pumps- characteristics-economics; Specials, Jointing, laying and maintenance, water hammer analysis; water distribution pipe networks Design, analysis and optimization – appurtenances – corrosion prevention – minimization of water losses – leak detection Storage reservoirs.

UNIT III WASTEWATER COLLECTION AND CONVEYANCE **10 Hours**

Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewer design; Wastewater pumps and pumping stations- sewer appurtenances; material, construction, inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance of corrosive wastewaters.

UNIT IV STORM WATER DRAINAGE **7 Hours**

Necessity- - combined and separate system; Estimation of storm water run-off Formulation of rainfall intensity duration and frequency relationships- Rational methods.

UNIT V CASE STUDIES AND SOFTWARE APPLICATIONS **10 Hours**

Use of computer software in water transmission, water distribution and sewer design – EPANET 2.0, LOOP version 4.0, SEWER, BRANCH, Canal ++ and GIS based softwares.

TOTAL: 45 HOURS

Employability

COURSE OUTCOMES:

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

CO1: Select various pipe materials for water supply main, distribution network and sewer

CO2: Design water supply main, distribution network and sewer for various field conditions

CO3: Troubleshooting in water and sewage transmission be able to use various computer software for the design of water and sewage network

REFERENCES:

1. Bajwa, G.S. Practical Handbook on Public Health Engineering, Deep Publishers, Shimla, 2003
2. "Manual on water supply and Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban

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1702EV105	PRINCIPLES AND DESIGN OF PHYSICO-CHEMICAL TREATMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To educate the students on the principles and process designs of various treatment systems for water and wastewater.
2. To educate the students on design of treatment systems and the components comprising such systems, leading to the selection of specific process.

UNIT I INTRODUCTION **5 Hours**

Pollutants in water and wastewater – characteristics, Standards for performance - Significance of physico-chemical treatment – Selection criteria-types of reactor- reactor selection-batch- continuous type-kinetics

UNIT II TREATMENT PRINCIPLES **10 Hours**

Physical treatment - Screening – Mixing, Equalization – Sedimentation – Filtration – Evaporation – Incineration – gas transfer – mass transfer coefficient Adsorption – Isotherms – Membrane separation, Reverse Osmosis, nano filtration, ultra filtration and hyper filtration electro dialysis, distillation – stripping and crystallization – Recent Advances. Principles of Chemical treatment – Coagulation flocculation – Precipitation – flotation solidification and stabilization – Disinfection, Ion exchange, Electrolytic methods, Solvent extraction – advanced oxidation /reduction – Recent Trends

UNIT III DESIGN OF MUNICIPAL WATER TREATMENT PLANTS **10 Hours**

Selection of Treatment – Design of municipal water treatment plant units – Aerators – chemical feeding – Flocculation – clarifier – tube settling – filters – Rapid sand filters, slow sand filter, pressure filter, dual media Disinfection - Displacement and gaseous type - Flow charts – Layouts – Hydraulic Profile, PID - construction and O&M aspects – case studies, Residue management – Upgradation of existing plants – Recent Trends.

UNIT IV DESIGN OF INDUSTRIAL WATER TREATMENT PLANTS **10Hours**

Design of Industrial Water Treatment Units- Selection of process – Design of softeners – Demineralisers – Reverse osmosis plants –Flow charts – Layouts –Hydraulic Profile, PID - construction and O&M aspects – case studies, Residue management – Upgradation of existing plants – Recent Trends.

UNIT V DESIGN OF WASTEWATER TREATMENT PLANTS **10 Hours**

Design of municipal wastewater treatment units-screens-detritors-grit chamber-settling tanks- sludge thickening-sludge dewatering systems-sludge drying beds - Design of Industrial Wastewater Treatment Units-Equalization- Neutralization-Chemical Feeding Devices-mixers- floatation units-oil skimmer Flow charts – Layouts –Hydraulic Profile, PID, construction and O&M aspects – case studies, Retrofitting - Residue management – Upgradation of existing plants – Recent Trends.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1: Develop conceptual schematics required for the treatment of water and wastewater

CO2: Translate pertinent forcing criteria into physical and chemical treatment system.

REFERENCES:

1. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse, Tata McGraw Hill, New Delhi, 2003.
2. Qasim, S.R., Motley, E.M. and Zhu.G. Water works Engineering – Planning, Design and Operation, Prentice Hall, New Delhi, 2002.
3. Lee, C.C. and Shun dar Lin, Handbook of Environmental Engineering Calculations, Mc Graw Hill, New York, 1999.

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1704EV106	ENVIRONMENTAL CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To train in the analysis of physical parameters of water and waste water
2. To train in the analysis of chemical parameters of water and waste water

LIST OF EXPERIMENTS:

1. Good Laboratory Practices, Quality control, Calibration of Glassware
2. Sampling and Analysis of water (pH, alkalinity, hardness chloride, Sulphate, turbidity EC, TDS, nitrate, fluoride)
3. Wastewater analysis (BOD, COD, Phosphate, TKN, Oil & Grease, Surfactant and heavy metals).
4. Sampling and analysis of air pollutants Ambient & Stack (RSPM, SO2 and NOx)
5. Sampling and characterization of soil (CEC & SAR, pH and K).

TOTAL:45 HOURS

COURSE OUTCOMES:

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

CO1: Assess quality of environment

CO2: Conduct analysis on characteristics of water and waste water

REFERENCES:

1. APHA, Standard Methods for the Examination of Water and Wastewater, 21st Ed.
2. Washington, 2005.
3. Laboratory Manual for the Examination of water, wastewater soil Rump, H.H. and Krist, H.
4. Second Edition, VCH, Germany, 1992.
5. Methods of air sampling & analysis, James P. Lodge Jr(Editor) 3rd Edition, Lewis publishers,Inc,USA,1989.

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1704EV107	ENVIRONMENTAL MICROBIOLOGY LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To train in the analysis of physical parameters of water and waste water
2. To train in the analysis of chemical parameters of water and waste water

LIST OF EXPERIMENTS:

1. Preparation of culture media
2. Isolation, culturing and Identification of Microorganisms
3. Microorganisms from polluted habitats (soil, water and air)
4. Measurement of growth of microorganisms, Assay of enzymes involved in biotransformation
5. Biodegradation of organic matter in waste water Analysis of air borne microorganisms
6. Staining of bacteria
7. Effect of pH, temperature on microbial growth
8. Pollutant removal using microbes from industrial effluent.
9. Effect of pesticides on soil microorganisms
10. Bacteriological analysis of wastewater (Coliforms, E.coli, Streptococcus) – MPN
11. Bacteriological analysis of wastewater (Coliforms, Streptococcus) - MF techniques
12. Effect of Heavy metals on microbial growth
13. Detection of Anaerobic bacteria (Clostridium sp.)
14. Bioreactors

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1: Field oriented testing of water, wastewater and solid waste for microbial contamination.

CO2: Perform toxicity test.

REFERENCES:

1. Standard methods for the examination of water and wastewater, American Public Health Association (21st edition) 2005.
2. Charles Gerba, Environmental Microbiology: A laboratory manual, Elsevier 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.

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1704EV108	COMMUNICATION SKILLS LAB I (Common to all M.E Progarmmes)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To acquire skills for using English in workplace effectively.
2. To communicate for essential business needs.
3. To prepare students for taking BEC Vantage level examination which is an International Benchmark for English language proficiency of Cambridge English Language Assessment

LIST OF EXPERIMENTS:

1. **GRAMMAR AND VOCABULARY**
   Forming asking complex questions – expressing purpose and function –modal verbs – impersonal passive voice– Reported speech – cause and effect – relative pronouns – expressions followed by – *ing* forms– acronyms – marketing terms / vocabulary – financial terms – collocations – discourse markers
2. **LISTENING**
   Purposes of listening – features of listening texts – potential barriers to listening – specific listening skills – strategies to use when listening– distinguishing relevant from irrelevant information – gap filling exercise – multiple-choice options – note completion – matching and multiple choice questions – listening for specific information, gist, topic, context and function.
3. **SPEAKING**
   Word and sentence stress – clear individual sounds – turn taking – initiating and responding - intonation patterns – pronunciation – mother tongue intrusion– conversation practice – turn-taking and sustaining the interaction by initiating and responding appropriately- Public Speech – Lectures.
4. **READING**
   Purposes of reading – potential barriers to reading – paraphrasing – identifying facts and ideas – skimming and scanning for information – matching statements with texts– spotting reference words – understanding text structure – understanding the ideas in a text – distinguishing between the correct answer and the distracter – understanding cohesion in a text – deciphering contextual meaning of words and phrases – cloze – proof reading - transcoding.
5. **WRITING**
   Paragraphing a text – using appropriate connectives – editing practice –Longer Documents: writing a proposal & Reports, Agenda – Minutes – Circular

TOTAL: 30 HOURS

ADDITIONAL EXPERIMENTS:

1. Body Language: Kinesics, Proxemics, Para linguistic, Nuances of Speech Delivery
2. Personality Development: Building self esteem
3. Team work

Employability

COURSE OUTCOMES:

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

CO1: To enable students to get International recognition for work and study.

CO2: To use English confidently in the International business environments.

CO3: To be able to take part in business discussion, read company literature, write formal and informal business correspondences and listen and understand business conversations

REFERENCES:

1. Guy Brook-Hart, "BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book", 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Cambridge Examinations Publishing, "Cambridge BEC VANTAGE – Self-study Edition", Cambridge University Press, UK, 2005.
3. Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting
4. The Process of Writing: Planning and Research, Writing, Drafting and Revising

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NAGAPATTINAM – 611 002

M.E. ENVIRONMENTAL ENGINEERING

Full Time Curriculum and Syllabus

First Year – Second Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701EV201	Principles and Design of Biological Treatment Systems	3	2	0	4	40	60	100
1702EV202	Air Pollution Monitoring and Control	3	0	0	3	40	60	100
1702EV203	Industrial Waste Management	3	0	0	3	40	60	100
1702EV204	Solid and Hazardous Waste Management	3	0	0	3	40	60	100
1702EV205	Environmental Impact Assessment	3	0	0	3	40	60	100
	Elective-I	3	0	0	3	40	60	100
Laboratory Course								
1704EV206	Unit Operations and Processes Laboratory	0	0	2	1	50	50	100
1704EV207	Technical Seminar	0	0	2	1	100	-	100
1704EV208	Communication Skills Lab II	0	0	2	1	100	-	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701EV201	PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEMS (Common to Full time and Part Time)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To educate the students on the principles and process designs of various treatment systems for water and wastewater and students should gain competency in the process employed in design of treatment systems and the components comprising such systems, leading to the selection of specific process.

UNIT I INTRODUCTION **10 Hours**

Objectives of biological treatment – significance – Principles of aerobic and anaerobic treatment - kinetics of biological growth – Factors affecting growth – attached and suspended growth - Determination of Kinetic coefficients for organics removal – Biodegradability assessment -selection of process- reactors-batch-continuous type.

UNIT II AEROBIC TREATMENT OF WASTEWATER **10 Hours**

Design of sewage treatment plant units –Activated Sludge process and variations, Sequencing Batch reactors, Membrane Biological Reactors-Trickling Filters-Bio Tower-RBC-Moving Bed Reactors-fluidized bed reactors, aerated lagoons, waste stabilization ponds – nutrient removal systems – natural treatment systems, constructed wet land – Disinfection – disposal options – reclamation and reuse – Flow charts, layout, PID, hydraulic profile, recent trends.

UNIT III ANAEROBIC TREATMENT OF WASTEWATER **10 Hours**

Attached and suspended growth, Design of units – UASB, up flow filters, Fluidized beds MBR, septic tank and disposal – Nutrient removal systems – Flow chart, Layout and Hydraulic profile – Recent trends.

UNIT IV SLUDGE TREATMENT AND DISPOSAL **5 Hours**

Design of sludge management facilities, sludge thickening, sludge digestion, biogas generation, sludge dewatering (mechanical and gravity) Layout, PID, hydraulics profile – upgrading existing plants – ultimate residue disposal – recent advances.

UNIT V CONSTRUCTION OPERATIONS AND MAINTENANCE ASPECTS **10 Hours**

Construction and Operational Maintenance problems – Trouble shooting – Planning, Organizing and controlling of plant operations – capacity building - Retrofitting Case studies – sewage treatment plants – sludge management facilities.

Total: 45 Hours

Course Outcomes:

After completion of the course, Student will be able to

1. Develop conceptual schematics required for biological treatment of wastewater
2. Translate pertinent criteria into system requirements.

References:

1. Arceivala, S.J., Wastewater Treatment for Pollution Control, TMH, New Delhi, Second Edition, 2000.
2. Manual on "Sewerage and Sewage Treatment" CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. Metcalf & Eddy, INC, „Wastewater Engineering – Treatment and Reuse, Fourth Edition, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2003.
4. F.R. Spellman, Hand Book of Water and Wastewater Treatment Plant operations, CRC Press, New York (2009).

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1702EV202	AIR POLLUTION MONITORING AND CONTROL (Common to Full time and Part Time)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To impart knowledge on the principles and design of control of indoor/particulate/gaseous air pollutant and its emerging trends.

UNIT I INTRODUCTION **7 Hours**

Structure and composition of Atmosphere – Sources and classification of air pollutants - Effects of air pollutants on human health, vegetation & animals, Materials & Structures – Effects of air Pollutants on the atmosphere, Soil & Water bodies – Long- term effects on the planet – Global Climate Change, Ozone Holes – Ambient Air Quality and Emission Standards – Air Pollution Indices – Emission Inventories – Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II AIR POLLUTION MODELLING **5 Hours**

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Transport & Dispersion of Air Pollutants – Modeling Techniques - Air Pollution Climatology.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS **11 Hours**

Factors affecting Selection of Control Equipment – Gas Particle Interaction, – Working principle, Design and performance equations of Gravity Separators (cyclone) , Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations - Process Control and Monitoring – Costing of APC equipment – Case studies for stationary and mobile sources.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS **11 Hours**

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations - Costing of APC Equipment – Case studies for stationary and mobile sources.

UNIT V INDOOR AIR QUALITY MANAGEMENT **11 Hours**

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control – Membrane process - UV photolysis – Internal Combustion Engines - Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

Total: 45 Hours

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Apply sampling techniques
2. Apply modelling techniques
3. Suggest suitable air pollution prevention equipment's and techniques for various gaseous and particulate pollutants to Industries. Discuss the emission standards

REFERENCES:

1. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004.
2. Noel de Nevers, Air Pollution Control Engg., Mc Graw Hill, New York, 1995.
3. David H.F. Liu, Bela G. Liptak „Air Pollution", Lweis Publishers, 2000.
4. Anjaneyulu. Y, „Air Pollution & Control Technologies" Allied Publishers (P) Ltd., India, 2002.
5. Arthur C.Stern, „Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
6. Wayne T.Davis, „Air Pollution Engineering Manual", John Wiley & Sons,Inc.,2000.
7. Daniel Vallero "Fundamentals of Air Pollution", Fourth Edition,2008.

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1702EV203	INDUSTRIAL WASTE MANAGEMENT (Common to Full time and Part Time)	L	T	P	C
		3	0	0	3

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 Hours**

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 **8 Hours**

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 **10 Hours**

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 **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.

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

1. Define the Principles of pollution prevention and mechanism of oxidation processes.
2. Suggest the suitable technologies for the treatment of wastewater.
3. Discuss about the wastewater characteristics
4. Design the treatment systems

REFERENCES:

1. Industrial wastewater management, treatment & disposal, Water Environment
2. Lawrance K.Wang, Yung . Tse Hung, Howard H.Lo and Constantine Yapijakis, " handlook of Industrial and Hazardous waste Treatment", Second Edition, 2004.
3. Metcalf & Eddy/ AECOM, water reuse Issues, Technologies and Applications, The Mc Graw- Hill companies, 2007.
4. Nelson Leonard Nemerow, "industrial waste Treatment", Elsevier, 2007.
5. W.Wesley Eckenfelder, "Industrial Water Pollution Control", Second Edition, Mc Graw Hill, 1989.
6. Paul L. Bishop, „Pollution Prevention: - Fundamentals and Practice", Mc-Graw Hill International, Boston, 2000.

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1702EV204	SOLID AND HAZARDOUS WASTE MANAGEMENT (Common to Full time and Part Time)	L 3	T 0	P 0	C 3

COURSE OBJECTIVES:

1. To impart knowledge and skills in the collection, storage, transport, treatment, disposal and recycling options for solid wastes including the related engineering principles, design criteria, methods and equipment.

UNIT I SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK **9 Hours**

Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management — Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes , plastics and fly ash – Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management.

UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION **8 Hours**

Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse.

UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES **9 Hours**

Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport.

UNIT IV WASTE PROCESSING TECHNOLOGIES **10 Hours**

Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes - treatment of biomedical wastes - Health considerations in the context of operation of facilities, handling of materials and impact of outputs on the environment.

UNIT V WASTE DISPOSAL **9 Hours**

Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation.

Total: 45 Hours

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Understand the characteristics of different types of solid and hazardous wastes and the factors affecting variation
2. Define and explain important concepts in the field of solid waste management and suggest suitable technical solutions for treatment of municipal and industrial waste
3. Understand the role legislation and policy drivers play in stakeholders' response to the waste and apply the basic scientific principles for solving practical waste management challenges

REFERENCES:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill International edition, New York, 1993.
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.
3. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2000.
4. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002.
5. Paul T Williams, Waste Treatment and Disposal, Wiley, 2005

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1702EV205	ENVIRONMENTAL IMPACT ASSESSMENT (Common to Full time and Part Time)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment and to develop the skill to prepare environmental management plan.
2. To provide knowledge related to the broad field of environmental risk assessment, important processes that control contaminant transport and tools that can be used in predicting and managing human health risks.

UNIT I INTRODUCTION **8 Hours**

Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA –.EIA process- screening – scoping - setting – analysis – mitigation. Cross sectoral issues and terms of reference in EIA – Public Participation in EIA.

UNIT II IMPACT IDENTIFICATION AND PREDICTION **10 Hours**

Matrices – Networks – Checklists –Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment.

UNIT III SOCIAL IMPACT ASSESSMENT AND EIA DOCUMENTATION **8 Hours**

Social impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN **7 Hours**

Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies.

UNIT V ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT **12 Hours**

Environmental risk assessment framework-Hazard identification -Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods – Event tree and fault tree analysis – Multimedia and multipathway exposure modeling of contaminant- Risk Characterization Risk communication - Employability

TOTAL: 45 HOURS

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Understand the necessity to study the impacts and risks that will be caused by projects or industries and the methods to overcome these impacts.
2. Know about the legal requirements of Environmental and Risk Assessment for projects.

REFERENCES:

1. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996
2. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003 World Bank –Source book on EIA
3. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York,1996.
5. K. V. Raghavan and A A. Khan, Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990.
6. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

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1704EV206	UNIT OPERATIONS AND PROCESSES LABORATORY (Common to Full time and Part Time)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To develop the skill for conducting Treatability studies of water and wastewater treatment by various Unit Operations and Processes using laboratory scale models.
2. To develop the skill for conducting Treatability studies of water and wastewater treatment by various Unit Operations and Processes using laboratory scale models.

LIST OF EXPERIMENTS:

1. Coagulation and Flocculation
2. Batch studies on settling
3. Studies on Filtration- Characteristics of Filter media
4. Water softening
5. Adsorption studies/Kinetics
6. Reverse Osmosis- Silt Density Index
7. Kinetics of suspended growth process (activated sludge process)- Sludge volume Index
8. Anaerobic Reactor systems / kinetics (Demonstration)
9. Advanced Oxidation Processes – (Ozonation, Photocatalysis)
10. Disinfection for Drinking water

Total: 45 Hours

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Conduct treatability studies for water and waste water treatment.
2. Design laboratory models for various unit operations and processes.

REFERENCES:

1. Metcalf and Eddy. Inc. „Wastewater Engineering, Treatment, Disposal and Reuse, Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. Lee, C.C. and Shun dar Lin. Handbook of Environmental Engineering Calculations, Mc Graw Hill, New York, 1999.
3. Casey T.J., Unit Treatment Processes in Water and Wastewater Engineering, John Wileys Sons, London, 1993.
4. David W.Hendricks, „Water Treatment Unit Processes: Physical and Chemical", CRC Press, Boca Raton, 2006.

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1704EV208	COMMUNICATION SKILLS LAB II (Common to all M.E Progarmmes)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To prepare students for taking BEC Vantage level examination conducted by the Cambridge English Language Assessment (CELA).
2. To communicate appropriately in business contexts.
3. To acquire skills for using English in business environment.

LIST OF EXPERIMENTS:

UNIT I SPEAKING

Non-verbal communication – agreeing / disagreeing, reaching decisions, giving and supporting opinions – making mini presentations – extending on conservations – collaborative task – tongue twisters.

UNIT II WRITING

Business letters – fax – Shorter Documents: e-mail - memo – message - note – report writing – formal / informal styles.

TOTAL: 30 HOURS

COURSE OUTCOMES:

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

CO1: Enable students to acquire business terms for communication.
CO2: Use English confidently in the business contexts.
CO3: Take part in business discussion and write formal and informal business correspondences.

REFERENCES:

1. Guy Brook-Hart, BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book, 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Cambridge Examinations Publishing, Cambridge BEC VANTAGE – Self-study Edition, Cambridge University Press, UK, 2005.

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E.G.S. PILLAY ENGINEERING COLLEGE

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NAGAPATTINAM – 611 002

M.E. ENVIRONMENTAL ENGINEERING

Full Time Curriculum and Syllabus

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1703EV008	**Elective III**- Membrane Technologies For Water And Waste Water Treatment	2	2	0	3	40	60	100
1703EV009	**Elective IV**- Remote Sensing and GIS Applications In Environmental Management	3	0	0	3	40	60	100
1703MF021	**Elective V**- Project Management	3	0	0	3	40	60	100
Laboratory Course								
1704EV301	Project Work Phase-I	0	0	12	6	50	50	100
Open Electives								
1703EV016	Air Pollution Monitoring and Control	3	0	0	3	40	60	100
1703EV017	Industrial Waste Management	3	0	0	3	40	60	100
1703EV018	Environmental Instrumentation	3	0	0	3	40	60	100
1703EV019	Cleaner Production and Environmental Management	3	0	0	3	40	60	100
1703EV020	Environmental Engineering And Pollution Control	3	0	0	3	40	60	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1703EV008	MEMBRANE TECHNOLOGIES FOR WATER AND WASTE WATER TREATMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

Principles and design of physic-chemical treatment systems.

COURSE OBJECTIVES:

1. To impart knowledge on the membrane filtration process.
2. To educate the students about the advanced membrane systems and design of bioreactors.
3. To develop the pretreatment and membrane treatment units.

UNIT I MEMBRANE FILTRATION PROCESSES **10 Hours**

Solid Liquid separation systems- Theory of Membrane separation – mass Transport Characteristics- Cross Flow filtration - Membrane Filtration- Flux and Pressure drop -Types and choice of membranes, porous, non-porous, symmetric and asymmetric – Plate and Frame, spiral wound and hollow fibre membranes – Liquid Membranes.

UNIT II MEMBRANE SYSTEMS **10 Hours**

Microfiltration principles and applications – Ultra filtration principles and applications - Nano Filtration principles and applications – Reverse Osmosis: Theory and design of modules, assembly, plant process control and applications – Electro dialysis : Ion exchange membranes, process design- Pervaporation – Liquid membrane – Liquid Pertraction – Supported Liquid Membrane and Emulsion Liquid membrane - Membrane manufactures – Membrane Module/Element designs – Membrane System components – Design of Membrane systems - pump types and Pump selection– Plant operations – Economics of Membrane systems.

UNIT III MEMBRANE BIOREACTORS **9 Hours**

Introduction and Historical Perspective of MBRs, Biotreatment Fundamentals, Biomass Separation MBR Principles, Fouling and Fouling Control, MBR Design Principles, Design Assignment, Alternative MBR Configurations, Commercial Technologies, Case Studies.

UNIT IV PRETREATMENT SYSTEMS **8 Hours**

Membrane Fouling – Control of Fouling and Concentration Polarisation-Pretreatment methods and strategies – monitoring of Pretreatment – Langlier Index, Silt Density Index, Chemical cleaning , Biofoulant control.

UNIT V CASE STUDIES **8 Hours**

Case studies on the design of membrane based water and wastewater treatment systems – zero Liquid effluent discharge Plants – Desalination of brackish water.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

Analyzing and developing the existing membrane systems with the help of recent technologies

COURSE OUTCOMES:

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

CO1 Familiar with main membrane processes, principles, separation mechanisms, and applications.
CO2 Understand the selection criteria for different membrane processes.
CO3 Know the principle of the most common membrane applications.
CO4 Analyze and design the pretreatment systems.
CO5 Carry out design of project for a particular membrane technology application.

REFERENCES:

1. Anthony Wachinski, Membrane Processes for water reuse, McGraw-Hill, USA, 2013
2. Baker, R.W., "Membrane technology and applications", 2nd., John Wiley 2004
3. Jorgen Wagner, "Membrane Filtration handbook, Practical Tips and Hints, 2nd Edition, Revision2, Osmonics Inc., 2001.
4. Noble, R.D. and Stern, S.A., "Membrane Applications", Elservier,Netherlands,1995.
5. Symon Jud, MBR Book – "Principles and application of MBR in water and wastewater treatment", Elservier, 2006.

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1703EV009	REMOTE SENSING AND GIS APPLICATIONS IN ENVIRONMENTAL MANAGEMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

Basics on remote sensing and GIS applications

COURSE OBJECTIVES:

1. To educate the students on aspects of Remote Sensing.
2. Develop the different remote sensing technique.
3. To educate the students on aspects of GIS and data management.
4. Develop the GIS Applications for monitoring and management of environment.

UNIT I REMOTE SENSING ELEMENTS **8 Hours**

Historical Perspective, Principles of remote sensing, components of Remote Sensing, Energy source and electromagnetic radiation, Electromagnetic spectrum, Energy interaction, Spectral response pattern of earth surface features, Energy recording technology.

UNIT II REMOTE SENSING TECHNOLOGY **9 Hours**

Classification of Remote Sensing Systems, , Aerial photographs, Photographic systems – Across track and along track scanning, Multispectral remote sensing, Thermal remote sensing, Microwave remote sensing – Active and passive sensors, RADAR, LIDAR

UNIT III SOCIAL IMPACT ASSESSMENT AND EIA DOCUMENTATION **9 Hours**

Social impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN **10 Hours**

Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies.

UNIT V ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT **9 Hours**

Environmental risk assessment framework-Hazard identification -Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods – Event tree and fault tree analysis – Multimedia and multipathway exposure modeling of contaminant- Risk Characterization Risk communication - Emergency Preparedness Plans –Design of risk management programs.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

Case studies on environmental risk assessment using Remote sensing and GIS applications.

COURSE OUTCOMES:

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

CO1 Understand the principles of basic elements of remote sensing
CO2 Know about the various the remote sensing techniques
CO3 Prepare EIA documentations with the help of GIS applications
CO4 Know about the legal requirements of Environmental and Risk Assessment for projects.
CO5 Understand the necessity to study the impacts and risks that will be caused by projects or industries and the methods to overcome these impacts.

REFERENCES:

1. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996
2. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003 World Bank –Source book on EIA
3. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York,1996.
5. K. V. Raghavan and A A. Khan, Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990.
6. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

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1703MF021	PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

1. Total Quality Management
2. Professional Ethics

COURSE OBJECTIVES:

1. To make the students to have on methods for project identification &appraisal.
2. To make the students to understand the Define and plan a project within the constraints of the environment
3. To make the students to have on Develop & analyze quantitative models for project selection &scheduling

UNIT I INTRODUCTION **9 Hours**

Introduction - Project Management: An Overview – Types, Characteristics of Projects – Project life cycle. Identification of investment opportunities - Screening and Selection, Project Appraisal.

UNIT II TECHNICAL ANALYSIS **9 Hours**

Market and demand analysis- market survey-demand forecasting methods-Technical analysis – manufacturing process, materials-product mix, plant location-project charts and layouts.

UNIT III FINANCIAL ANALYSIS **9 Hours**

Financial analysis – cash flows for project appraisal- Investment evaluation using capital budgeting techniques - net present value, profitability index internal rate of return, payback period, accounting rate of return.

UNIT IV NETWORK MANAGEMENT **9 Hours**

Mathematical Techniques for project evaluation – Linear programming, goal programming, Network technique for Project Management – CPM, PERT, Multiple projects and constraints, scheduling.

UNIT V PROJECT MANAGEMENT **9 Hours**

Organization systems for project implementation- Work Breakdown-coordination and control- Project Management Software's.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Software for project management.
2. Software for financial analysis.
3. Project management for automotive industry.

Employability

COURSE OUTCOMES:

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

CO1 Explain the methods for project identification &appraisal.
CO2 Define and plan a project within the constraints of the environment
CO3 Develop & analyze quantitative models for project selection &scheduling.
CO4 Analyse network techniques using CPM and PRT.
CO5 Organise the system for project implementation.

REFERENCES:

1. Prasanna Chandra, "Projects – Planning, Analysis, Financing, Implementation and Review", Tata McGraw Hill,4thEd,1997
2. S.Choudry "Project Management", Tata McGraw Hill,27th Edition,2006.
3. John M Nicholas, "Project Management for Business and Technology", 2nd Edition, Pearson Education Asia,2001

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