SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR - 440013

An Autonomous College affiliated to
Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME & SYLLABI
2017-21

B. E. (CIVIL ENGINEERING)

Published by
Dr. R.S. Pande
Principal
Shri Ramdeobaba College of Engineering & Management
Ramdeo Tekdi, Gittikhadan, Katol Road, Nagpur - 440 013
Ph. : 0712-2580011 Fax : 0712 - 2583237
ISO 9001 : 2008 CERTIFIED ORGANISATION

About the Department

Civil Engineering Department was established in 1984 at the time of inception of Shri Ramdeobaba College of Engineering & Management (previously RKNEC) with intake of 60 students. The department has experienced and highly qualified faculty; it is equipped with sophisticated laboratories and latest computational softwares which helps the students to develop expertise in Civil Engineering. Civil Engineering Department offers Undergraduate Programme B. E. in Civil Engineering (1st shift and 2nd shift) and two Post Graduate Programmes namely M. Tech., Structural Engineering (Full Time) and M. Tech., Geotechnical Engineering (Part Time).

The Department of Civil Engineering is one of the prime partners in success stories of the institute. The department has all the state of the art laboratories and faculties that provide excellent opportunities for students as well as researchers. The department is accredited by National Board of Accreditation and well recognized by Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur. The department is closely associated with industry and extending its testing & consulting services. For overall development of the student, the department provides conducive atmosphere for organization & conduction of various co-curricular and extra-curricular programs while imparting outcome based quality education.

Departmental Vision

To be a knowledge centre in civil engineering education, training, research, entrepreneurship and industry outreach services for creating sustainable infrastructure and enhancing quality of life.

Department Mission

To generate quality civil engineers with strong technical and managerial skills through creation of conducive environment for creative learning and research in association with stake holders.

Programme Educational Objectives

1. Demonstrate professional competence in various civil engineering fields.
2. Exhibit technical ability to deal with and execute various civil engineering problems.
3. Exhibit managerial skills, values and engage themselves in life long learning.

Program outcomes

Engineering Graduates will be able to :

1. **Engineering knowledge :** Apply the knowledge of mathematics, science, enginering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis :** Identify, formulate, review research literature, and analyze complex engineering problems reaching substaintiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions :** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems :** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage :** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society :** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability :** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics :** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work :** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication :** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance :** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning :** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program specific objectives :

1. Analyse and design various civil engineering structures by analytical, numerical, graphical and simulation methods.
2. Plan, estimate, execute and manage civil engineering projects with due consideration to economic, safety and environmental issues while following ethical practices.

Teaching Scheme for First Year (Semester I and II) Bachelor of Engineering

GROUP 1: SEMESTER I / GROUP 2: SEMESTER II

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	MAT101 MAT102	Engineering Mathematics-I/II	4	1	0	9	40	60	100	3 Hrs.
2	PHT101	Engineering Physics	4	1	0	9	40	60	100	3 Hrs.
3	PHP101	Engineering Physics lab	0	0	3	3	25	25	50	-
4	EET101	Electrical Engineering	3	1	0	7	40	60	100	3 Hrs.
5	EEP101	Electrical Engineering lab	0	0	2	2	25	25	50	-
6	CST101	Computer Programming	2	0	0	4	40	60	100	3 Hrs.
7	CSP101	Computer Programming lab	0	0	2	2	25	25	50	-
8	HUT101	Communication Skills	2	0	0	4	40	60	100	3 Hrs.
9	HUP101	Communication Skills lab	0	0	2	2	25	25	50	-
10	PEP101	Sports/Yoga	0	0	2	0	-	-	-	-
		TOTAL	**15**	**3**	**11**	**42**	**300**	**400**	**700**	

Teaching Scheme for First Year (Semester I and II) Bachelor of Engineering

GROUP 1 : SEMESTER II / GROUP 2 : SEMESTER I

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	MAT102 MAT101	Engineering Mathematics-II/I	4	1	0	9	40	60	100	3 Hrs.
2	CHT101	Engineering Chemistry	4	1	0	9	40	60	100	3 Hrs.
3	CHP101	Engineering Chemistry lab	0	0	3	3	25	25	50	-
4	CET101	Engineering Mechanics	3	1	0	7	40	60	100	3 Hrs.
5	CEP101	Engineering Mechanics lab	0	0	2	2	25	25	50	-
6	MET101	Engineering Drawing	3	0	0	6	40	60	100	4 Hrs.
7	MEP101	Engineering Drawing lab	0	0	3	3	25	25	50	-
8	HUT102	Social Skills	2	0	0	4	40	60	100	3 Hrs.
9	INP102	Workshop	0	0	2	2	25	25	50	-
		TOTAL	**16**	**3**	**10**	**45**	**300**	**400**		

Scheme of Teaching & Examination of Bachelor of Engineering (Civil Engineering)
Semester Pattern
III Semester, B.E. (Civil Engineering)

Sr. No.	Subject Code	Subject Name	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	MAT201	Engineering Mathematics -III	3	1	0	7	40	60	100	3 Hrs.
2	CET201	Strength of Materials	3	1	0	7	40	60	100	3 Hrs.
3	CEP201	Strength of Materials	0	0	2	2	25	25	50	-
4	CET202	Fluid Mechanics-I	3	1	0	7	40	60	100	3 Hrs.
5	CEP202	Fluid Mechanics-I	0	0	2	2	25	25	50	-
6	CET203	Geotechnical Engineering-I	3	1	0	7	40	60	100	3 Hrs.
7	CEP203	Geotechnical Engineering-I	0	0	2	2	25	25	50	-
8	CET204	Engineering Geology	3	1	0	7	40	60	100	3 Hrs.
9	CEP204	Engineering Geology	0	0	2	2	25	25	50	-
10	CHT201	Environmental Studies-I	2	0	0	0	-	-	-	-
		Total	**17**	**5**	**8**	**43**				

Scheme of Teaching & Examination of Bachelor of Engineering (Civil Engineering)
Semester Pattern
IV Semester, B.E. (Civil Engineering)

Sr. No.	Subject Code	Subject Name	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	CET205	Structural Analysis-I	3	1	0	7	40	60	100	3 Hrs.
2	CEP205	Structural Analysis-I	0	0	2	2	25	25	50	-
3	CET206	Building Construction and Materials	3	1	0	7	40	60	100	3 Hrs.
4	CET207	Environmental Engineering-I	3	1	0	7	40	60	100	3 Hrs.
5	CEP207	Environmental Engineering-I	0	0	2	2	25	25	50	-
6	CET208	Concrete Technology	3	1	0	7	40	60	100	3 Hrs.
7	CEP208	Concrete Technology	0	0	2	2	25	25	50	-
8	CET209	Surveying-I	3	1	0	7	40	60	100	3 Hrs.
9	CEP209	Surveying-I	0	0	3	3	25	25	50	-
10	CHT202	Environmental Studies-II	2	0	0	0	-	-	-	-
		Total	**17**	**5**	**9**	**44**				

● Optional two weeks field training after examination to sites such as flat schemes, bridges, roads, surveying, software etc.

Scheme of Teaching & Examination of Bachelor of Engineering (Civil Engineering)
Semester Pattern
V Semester, B.E. (Civil Engineering)

Sr. No.	Subject Code	Subject Name	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	CET301	Steel Structures	3	1	0	7	40	60	100	4 Hrs.
2	CEP301	Steel Structures	0	0	2	2	25	25	50	-
3	CET302	Environmental Engineering-II	3	1	0	7	40	60	100	3 Hrs.
4	CET303	Surveying- II	3	1	0	7	40	60	100	3 Hrs.
5	CEP303	Surveying- II	0	0	2	2	25	25	50	-
6	CET304	Transportation Engineering-I	3	1	0	7	40	60	100	3 Hrs.
7	CEP304	Transportation Engineering-I	0	0	2	2	25	25	50	-
8	CET305	Building Design and Drawing	1	1	0	3	25	25	50	3 Hrs.
9	CEP305	Building Design and Drawing	0	0	2	2	25	25	50	-
10	CET306	Hydrology and Water Resources	4	1	0	9	40	60	100	3 Hrs.
11	CEP307	Technical Writing	0	0	2	0	-	-	-	-
		Total	**17**	**6**	**10**	**48**				

Scheme of Teaching & Examination of Bachelor of Engineering (Civil Engineering)
Semester Pattern
VI Semester, B.E. (Civil Engineering)

Sr. No.	Subject Code	Subject Name	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	CET308	Estimating and Costing	3	1	0	7	40	60	100	4 Hrs.
2	CEP308	Estimating and Costing	0	0	2	2	25	25	50	-
3	CET309	RCC Structures	3	1	0	7	40	60	100	4 Hrs.
4	CEP309	RCC Structures	0	0	2	2	25	25	50	-
5	CET310	Geotechnical Engineering-II	3	1	0	7	40	60	100	3 Hrs.
6	CET311	Fluid Mechanics-II	3	1	0	7	40	60	100	3 Hrs.
7	CEP311	Fluid Mechanics-II	0	0	2	2	25	25	50	-
8	CEP312	Computer Application in Civil Engineering	0	0	3	3	50	50	100	-
9	CEP313	Site visits	0	0	2	2	-	-	-	-
10	CET314	Open Elective	3	1	0	7	40	60	100	3 Hrs.
		Total	**15**	**5**	**11**	**46**				

OPEN ELECTIVE

Course Code	Course Name
CET314-1	Environmental Pollution
CET314-2	Green Building and Vastu Concepts
CET314-3	Appropriate Technology

● For CET 314-3 Appropriate Technology, Section A will be set and evaluated by Mechanical Engineering Department and Section B will be set and evaluated by Civil Engineering Department

● Compulsory one month field training after examination to sites such as flat schemes, bridges, roads, surveying, software etc.

Scheme of Teaching & Examination of Bachelor of Engineering (Civil Engineering)
Semester Pattern
VII Semester, B.E. (Civil Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	CET401	Advanced Concrete Structures	3	1	0	7	40	60	100	4 Hrs.
2	CEP401	Advanced Concrete Structures	0	0	2	2	25	25	50	-
3	CET402	Irrigation Engineering	3	1	0	7	40	60	100	3 Hrs.
4	CEP402	Irrigation Engineering	0	0	2	2	25	25	50	-
5	CET403	Contract, Accounts and Works Management	3	1	0	7	40	60	100	3 Hrs.
6	CET404	Elective - I	3	1	0	7	40	60	100	3 Hrs.
7	CET405	Structural Analysis II	3	1	0	7	40	60	100	3 Hrs.
8	CEP405	Structural Analysis II	0	0	2	2	25	25	50	-
9	CEP406	Project and Seminar	0	0	2	4	50	-	50	-
		Total	**15**	**5**	**8**	**45**				

Course Code	Elective - I
CET 404 - 1	Advanced Construction Materials
CET 404 - 7	Urban Transport Planning
CET 404 - 3	Advanced Hydraulics
CET 404 - 4	Advanced Geotechnical Engineering
CET 404 - 5	Environmental Management
CET 404 - 6	Advanced Steel Design

Scheme of Teaching & Examination of Bachelor of Engineering (Civil Engineering)
Semester Pattern
VIII Semester, B.E. (Civil Engineering)

Sr. No.	Code	Course	L	T	P	Credits	Maximum Marks			Exam Duration
							Internal Assessment	End Sem Exam	Total	
1	CET 407	Transportation Engineering II	3	1	0	7	40	60	100	3 Hrs.
2	CET 408	Construction Management	3	1	0	7	40	60	100	3 Hrs.
3	CET 409	Elective II	3	1	0	7	40	60	100	3 Hrs.
4	CET 410	Elective III	3	1	0	7	40	60	100	3 Hrs.
5	CET 411	Elective IV	3	1	0	7	40	60	100	3 Hrs.
6	CEP 411	Elective IV	0	0	2	2	25	25	50	-
7	CEP 412	Project	0	0	6	12	75	75	150	-
		Total	**15**	**5**	**8**	**49**				

Course Code	Elective II	Course Code	Elective III	Course Code	Elective IV
CET 409 - 1	Water Power Engineering	CET 410 - 7	Open Channel Hydrwlics	CET 411 - 1 CEP 411 - 1	Applied Remote Sensing and GIS
CET 409 - 2	Earth and Earth Retaining Structures	CET 410 - 2	Advanced RCC	CET 411 - 2 CEP 411 - 2	Traffic Engineering
CET 409 - 3	Air Pollution and Solid Waste Management	CET 410 - 8	Industrial Waste Water Treatment	CET 411 - 3 CEP 411 - 3	Water and Waste Water Treatment
CET 409 - 4	Multi Storied Structures	CET 410 - 4	Pavement Design	CET 411 - 4 CEP 411 - 4	Water Transmission and Distribution System
CET 409 - 5	Advanced Transportation Engineering	CET 410 - 5	Rock Mechanics	CET 411 - 5 CEP 411 - 5	Ground Improvement
CET 409 - 6	Maintenance & Rehabilitation of Civil Engg. Structures	CET 410 - 6	Building Services	CET 411 - 6 CEP 411 - 6	Bridge Engineering

Syllabus of Group 1 - Semester I and Group 2 - Semester I, Bachelor of Engineering

Course Code : MAT101 **Course : Engineering Mathematics-I**

L: 4 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits : 09**

Course Objective

Course objective of this course is to provide understanding the concepts of Mathematics and its application to Engineering. This course introduces the student to Differential Calculus for one and several variable, Differential Equations and Infinite Series.

Course Outcomes

On successful completion of the course, student shall be able to

1. Solve Engineering problems using the concept of Differential Calculus.
2. Get analytical solution of Ordinary Differential Equations in Engineering.
3. Test convergence of Infinite series.

Syllabus

Unit - I: Ordinary Differential Calculus: Successive differentiation, Taylor's and Maclaurin's series for function of one variable, indeterminate forms, curvature, radius of curvature and circle of curvature.

Unit - II: Partial Differentiation: Functions of several variables, first and higher order derivative, Euler's Theorem, Chain rule and Total differential coefficient, Jacobians. Taylor's and Maclaurin's series for function of two variables, Maxima and minima for function of two variables, Lagrange's method of undetermined multipliers.

Unit - III: Infinite Series: Convergence, divergence and oscillation of series, General properties, Tests of convergence, Alternating series.

Unit - IV: First Order Differential Equation: First order first degree differential equations: Linear, reducible to linear, exact and reducible to exact differential equations; Non-linear differential equations.

Unit - V: Higher Order Differential Equation: Higher order differential equations with constant coefficient, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations, simultaneous differential equations, differential equation of the type d2y/dx2 = f(x) and d2y/dx2 = f(y).

Unit - VI: Applications of Differential Equation: Applications of first order first degree differential equations: Simple electrical circuits in series. Application of higher order differential equations: Mechanical and electrical Oscillatory circuits (free, damped, forced oscillations)

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, Delhi.
2. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India)
3. Advanced Engineering Mathematics, 2 ed , Jain ,Iynger , Narosa publication

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, Neekunj print process, Delhi.
2. Schaum's Outline of Differential Equations, Richard Bronson , TMH, 3ed, New Delhi
3. Engineering Mathematics by Srimanta, Paul
4. A text book of Applied Mathematics I, T. Singh, K.L. Sarda, Professional Publishing House Pvt.Ltd., Nagpur.

Syllabus of Group 1 - Semester I and Group 2 – Semester II, Bachelor of Engineering

Course Code : PHT101 **Course : Engineering Physics**

L: 4 Hrs, T: 1 Hr, P : 0 Hr., Per week **Total Credits : 09**

Course Objectives :

1. To develop the ability to apply concepts in elementary physics to understanding of engineering applications;
2. To introduce more advanced physics concepts, which form the basis of modern engineering;
3. To provide a sound foundation in mathematical formulation of concepts learnt and their applications;
4. To elaborate the general nature of concepts learnt and of possibility of their cross-disciplinary application;
5. To develop skills for numerical problem solving in areas covered

Course Outcomes :

At the end of the course the students

1. will be able to recognize and analyze phenomena of interference, diffraction and polarization of light waves ;
2. will understand principles of laser action and basic working of many types of laser devices ;
3. will understand geometrical theory of optical fibre communication and the phenomena of attenuation and dispersion of electrical signals in the fibre ;
4. will understand fundamental notions in quantum mechanics such as wave particle duality, de Broglie matter waves, Heisenberg uncertainty relations, wave function of system, quantum confinement, quantization of energy and quantum tunneling of potential barriers;
5. will understand concepts like Fermi energy and density of states, understand calculation of carrier density and electrical conductivity in intrinsic and semiconductors and understand the behaviour of pn-junction;
6. will understand broad principles of electromagnetic electron lenses, cyclotron, mass spectrograph and working of the CRO;
7. will understand the reasons for novel properties at nano-scale, be familiar with elements of some of the methods of synthesis and characterization and some of the properties of such materials ;
8. will be able to understand and perform numerical calculations in areas of optics, lasers, optical fibres, quantum physics, semiconductors, charged particle devices and nano physics at the level defined above for these.

Unit-I:

Optics:

Interference in thin films, division of amplitude and wavefront, wedge-shaped films, Newton's rings, antireflection coatings; Diffraction, single slit, double slit, Different types of polarization of light, Malus' law, production of plane polarized light, birefringence, wave plates.

Unit-II:

Quantum Physics:

Wave-particle duality, wave packets, Heisenberg uncertainty relations; Wave function, probability Schrodinger's equation, time dependent equation and its separation; Infinite potential and finite potential wells, phenomenon of tunneling.

Unit-III:

LASERs and Optical Fibres:

Interaction of matter and radiation, LASER, spontaneous and stimulated emission, population inversion; Common types of lasers and their applications; Optical fibres, structure, types, propagation in a fibre, modes of propagation, signal attenuation, signal distortion.

Unit-IV:

Mass Spectrograph and Particle Accelerators :

Principles of electron optics, cathode ray tube, cathode ray oscilloscope, mass spectrographs, particle accelerators.

Unit-V:

Semiconductors:

Band structure of solids, band diagrams of insulators, semiconductors and conductors, Fermi level in conductors and semiconductors, carrier concentration, conductivity, effective mass; Junction diode and its band diagram, depletion region and barrier potential, diode rectifier equation.

Unit-VI:

Nanophysics:

What is Nanotechnology? Fullerenes and nanoparticles; Outline of methods of preparation; Elements of electron microscopy; Scanning probe microscopy, Outline of properties – physical, thermal, optical, electrical, magnetic; Quantum size-effects; CNTs; Applications.

Text Books:

1. Fundamentals of Physics: D. Halliday, R. Resnik and J. Walker, John Wiley.
2. Engineering Physics: S. Jain and G.G. Sahasrabudhe, Universities Press (2010) / Applied Physics : S. Jain Sahastrabuddhe and S.M. Pande.
3. Introduction to Nanoscience and Nanotechnology: K.K. Chattopadhyay and A.N. Banerjee, PHI Learning (2009)

Reference Books:

1. Electronic Engineering Materials and Devices: J. Allison, TMH.
2. Engineering Physics: H. Malik and A.K. Singh, TMH (2010).
3. Engineering Physics: D.K. Bhattacharya and A.Bhaskaran, Oxford University Press (2010)

Syllabus of Group 1 - Semester I and Group 2 – Semester II, Bachelor of Engineering

Course Code: PHP101 **Course: Engineering Physics Laboratory**

L: 0 Hrs., T: 0 Hrs., P: 3 Hrs., Per week **Total Credits: 03**

Course Outcomes :

1. Students should be able to perform tasks like leveling, alignment, reading vernier scales, do specific measurements, systematically record observations, do calculations from data collected and draw conclusions.
2. Students gain working familiarity with instruments like simple spectrometer, travelling microscope, lenses, prisms, ammeter, voltmeter, the CRO, power supplies etc.;
3. Students gain better understanding of concepts like interference, diffraction, polarization, energy band gap \in semiconductor etc.
4. Students gain a working knowledge of estimating errors in an experiment for which background theory is known;
5. Students should be able to subject data collected to statistical and error analysis.

A minimum of 8 experiments to be performed from the following list of experiments.

List of Experiments :

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following list:

1. Study of diodes
2. Study of transistors
3. Study of thermistors
4. Study of phenomena of interference due to thin films.
5. Diffraction of light by slit(s), an edge, obstacles, etc.
6. Hall effect
7. Study of CRO
8. Graph plotting, curve fitting, visualization using Mathematica

Reference Books :

1. Physics Lab Manual written by the Teaching Faculty of Physics Department, RCOEM.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : EET101 **Course : Electrical Engineering**

L:3 Hr., T:1 Hrs., P:0 Hrs., Per week **Total Credits : 07**

Course Outcomes :

Upon completion of this course, the students shall be able to,

1. Apply the basic laws of electric and magnetic circuits to obtain the unknown quantities.
2. Represent and interpret the sinusoidal electrical quantities mathematically as well as graphically in the form of waveforms/phasors and analyze the 1-phase/3-phase AC circuits to determine the unknown quantities.
3. Determine the power losses/efficiency and voltage drop/voltage regulation of a 1-phase transformer at full load condition and demonstrate the knowledge related with its need, construction, principle, types and applications.
4. Describe the construction, principle, applications and performance characteristics of DC machines and Induction motors.
5. Demonstrate the concept of electrical power generation, transmission, distribution and the understanding about conventional/renewable energy sources.
6. Demonstrate the understanding about necessity of electrical earthing, safety & protecting devices, electrical energy utilization, illumination sources and their selection.

Unit-I:

DC Electric Circuits: Definition of EMF, Current, Power, Energy Resistance, Variation of resistance with physical parameters viz. length, area, specific resistivity and temperature. Ohm's law, resistances in series and parallel, current and voltage division rules, KVL & KCL, star delta transformation and related numerical. Measurement of DC electrical quantities.

Magnetic Circuit: Concept of MMF, Flux, reluctance, analogy with electric circuits, B-H curve, simple numerical on series magnetic circuits.

Unit-II:

AC Circuits: Generation of single phase and three phase alternating EMF. Average and RMS values for sinusoidal waveform. Phasor representation of sinusoidal electrical quantities, Steady state behavior of RLC circuits with sinusoidal excitation. Reactance, impedance, Power & Energy in AC Circuits. Simple numerical on series and parallel AC circuits. Concept & importance of power factor & its improvement (with simple numerical).

Simple analysis of balanced three phase AC circuits, Star-delta resistive networks. Measurement of AC electrical quantities.

Unit-III:

Introduction to Electrical Power System :

Introduction to Power Generation (Thermal, Hydro, Nuclear, Wind and Solar) with block schematic representation only. Single line diagram for Generation, Transmission & Distribution through different voltage levels; Low voltage radial distribution system (Over head & underground, single phase and three phase).

Necessity of equipment earthings, Fuses (Rewirable and HRC), MCB, ELCB.Basic operation of UPS and Inverters (Block schematic representation).

Unit-IV:

Single phase Transformer :

Principle of operation, Construction Transformer ratings, No load and On load operation with leakage reluctance, losses, efficiency, Definition & formula for voltage regulation, OC/ SC test, equivalent circuit referred to primary side of transformer.

Unit-V:

Rotating Electric Machines :

DC Machines: DC Generator-Principle of working, construction (without details of armature winding), classification of DC generators. DC Motors-Back EMF, necessity of starters, speed and torque equations, characteristics of motors, speed control of DC motors (without numerical), Application of DC motors.

Three Phase Induction Motors: Working principles, types and construction of three phase Induction Motor, synchronous speed, torque, slip, torque slip characteristics, applications of three phase Induction motor.

Single Phase Induction Motors: operating principle of capacitor start and run single phase induction motor and its applications.

Unit-VI:

Utilization of Electrical Energy :

Illumination: Definition of luminous flux, luminous intensity, Candle power, illumination, Luminance, Luminous efficiency (lumens/watt) of different types of lamps, working principle of Fluorescent/Sodium Vapour/ Mercury vapor & CFL Lamps. Simple numerical to determine number of lamps to attain a given average lux level in an area.

Electric Heating: Advantages of Electrically produced heat, types and applications of Electric heating equipment, transfer of heat (conduction, convection, radiation); Resistance ovens, Induction heating (Core & coreless type), Dielectric heating. (Note. Numerical excluded)

Tariff: One part (KWH based) tariff with simple numerical; to calculate the domestic electricity charges.

Text Books :

1. Elements of Electrical sciences: P. Mukhopadhyay, N. Chand & Bros Roorkee (1989).
2. Electrical Technology: B. L. Thareja, S. Chand Publications.
3. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd.

Reference Books :

1. Basic Electrical Engineering: T.K. Nagasarkar& M. S. Sukhija, Oxford Univ. Press.
2. Utilization of Electrical Energy: H. Pratab, Dhanpatrai& Sons.
3. Utilization of Electrical Energy: E. Openshaw Taylor, Orient Longman.
4. Websites: www.powermin.nic.in, www.mnes.nic.in, www.mahaurja.com.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : EEP101 **Course: Electrical Engineering Lab**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week **Total Credits : 02**

Course Outcomes :

Upon completion of this course, the students shall be able to,

1. Connect the electric circuits based on the syllabus of theory subject EET101 and test the performance by way of observation, calculations and conclusion.
2. Demonstrate the concept and significance of power factor and how it can be improved.
3. Conduct an electrical energy survey of connected load at residential premises and demonstrate the understanding of energy tariff by calculating the energy bill in accordance with the norms of State Electricity Distribution Company.

List of Experiments :

1. To verify Kirchoff's voltage and current law using D.C. source.
2. To study the R-L-C series circuit with AC source
3. To study R-L-C parallel circuit with AC source
4. To perform direct load test on 1-phase transformer for finding regulation and efficiency
5. To perform open circuit and short circuit tests on 1-phase transformer
6. To study 3-phase star delta connections and verify different relations of voltage, current and power
7. To study the speed control techniques for DC shunt motor
8. To study the importance of power factor and improvement of power factor using static capacitors.
9. To analyze energy bill of residential category and prepare energy sheet.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code: CST101 **Course : Computer Programming**

L: 2 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits: 4**

Course Outcomes

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

1. Understand basics of computer, software, number systems, flowchart and algorithms.
2. Design and code well-structured C programs.
3. Write program on the basis of decision control structures and loop control structures.
4. Perform sorting and various other operations on 1-D and 2-D array.
5. Perform operations on structures, functions and pointers.

Syllabus

Unit-I :

Computer Fundamentals: Basic Structure of a computer, Input/output devices and memories, types of computer. Introduction to DOS and Windows OS, Number Systems: Decimal, Binary, Octal, Hexadecimal and conversion from one to another. Algorithm – Conventions used in writing algorithm, Software Life Cycle, Program and Programming Languages Procedural, Object oriented, High level, Assembly, Machine Language. System Software - Translator, Compiler, Interpreter, Linker, Loader and Flowchart.

Unit-II :

C Programming Language: Keyword, Constant, Variable, Data types, Operators, Types of Statements, Preprocessor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch case.

Unit-III :

Loop Control Structure: go to, while, for, do while, break, continue. Storage classes, Enumerated Data types, Renaming Data types with typedef(), Type Casting, Bitwise Operators.

Unit-IV :

Array: Introduction, array Declaration, Single and multidimensional array. Pointers: Introduction, Definition and use of pointer, Pointer arithmetic, pointer operators, pointer and array, pointer to pointer

Unit-V :

Structures and Union: Declaring and using structure, Structure initialization, Structure within structure, array of structure, pointer to structure.

Unit-VI :

Function Programming: Introduction, User Defined and Library Function, Parameter passing, Return value, Recursion, pointer and function.

Text Books :

1. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill
2. Programming in ANSI C,5th ed. : E. Balguruswami McGraw Hill

Reference Books :

1. Let Us C.9thed: Yashwant Kanetkar, BPB Publication
2. Programming with C: Byron Gottfried, Schaums Outline Series.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code: CSP 101 **Course: Computer Programming Lab**

L: 0 Hrs., T: 0 Hrs., P:2 Hrs. Per week **Total Credits: 2**

Course Outcomes :

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

1. Implement programs based on if-else, switch and loop structure.
2. Implement programs based on 1-D and 2-D numeric and character arrays.
3. Perform operation on structure and pointer.
4. Design programs based on functions.

CSP101practicals based on above CST 101 syllabus

Syllabus of Group 1- Semester I and Group 2-Semester II, Bachelor of Engineering

Course Code : HUT101 **Course:-Communication Skills**

L:2 Hrs.,T:0Hrs.,P:0Hrs.,Per week **Total Credits:4**

Course Outcomes :

1. Students have better reading comprehension, pronunciation, and functional English grammar.
2. Students are able to write letters and resumes
3. Students are able to organize their thoughts for effective presentation and writing.
4. Students are able to learn skills to present themselves well in an interview, and handle a Group Discussion

Syllabus

Unit-I : Communication : What is Communication, the Media of Communication, Channels of Communication, Barriers to Effective Communication, Role of Communication Skills in Society.

Unit-II : Reading Comprehension : The Process of Reading, Reading Strategies Central idea, Tone and Intention, Comprehension Passages for practice.

Unit-III : Professional Speaking: Components of an effective talk, Idea of space and time in public speaking, Tone of voice, Body language, Timing and duration of speech, Audio-Visual Aids in speech. Presentation Skills, Group Discussion and Job Interviews

Unit IV : Orientation to Literary and Scholarly Articles: Preferably two fictional and two non-fictional texts (Selected by the teachers and the Head). The art of writing articles on social, cultural, scientific and technical issues (Paragraph Writing), Exercises.

Unit V : Business Correspondence: Types and Formats of Business letters, Routine Business Letters (Inquiry, Order, Instruction, Complaint, Adjustment), Sales Letters, Resumes and Job applications, Business Memos, Emails.

Unit VI: Grammar: Synonym and Antonym, Give one word for, Voice, Narration and Comparison of Adjectives and Adverbs, Transformation of sentences and Common Errors, Idioms and Phrases, Note Making, Précis writing.

Text Book :

1. M. Ashraf. Rizvi. Effective Technical Communication. Tata Mc Graw-Hill Publishing Company Limited.2009

Reference Books :

1. Sanjay Kumar and Pushp Lata. Communication Skills. Oxford Publication
2. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Second Edition Oxford Publication.2011
3. Anne Nicholls. Mastering Public Speaking. Jaico Publishing House.2003
4. Dr Asudani .V. H An easy approach to English. Astha Publication Nagpur. 2009 , 3rd Edition.

Syllabus of Group 1- Semester I and Group 2-Semester II, Bachelor of Engineering

Course Code : HUP101 **Course : Communication Skills Lab**

L:0Hrs.,T:0Hrs.,P:2Hrs.,Per week **Total Credits:2**

Course Outcomes

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

1. Learn presentation skills
2. Understand effective strategies for Personal Interview and Group Discussions
3. Learn and apply effective language skills – listening, speaking, reading and writing

Sr. No	Name of the Practical	Activities Taken	Medium of Practical
1	Speaking Skills	1. Introduction to effective ways of speaking 2. Oral presentations Extempore / Debate / JAM/Self-introduction	PPT Based, Activity Based
2	Presentation Skills	1. Preparing visual aids/PPTs on given topics	PPT Based, Activity Based, Open Source CDs
3	Group Discussion-Orientation	1. GD types 2. GD techniques/rules - videos 3. General/familiar topics for discussion	Open Source CDs PPT based Activity based
4	Group Discussion-Practice session	1. Divide in group of 6 2. Classification of topics 3. Feedback	PPT Based, Activity Based
5	Group Discussion-Mock	1. Divide in group of 6 2. Mock GDs - types 3. Feedback	Activity Based
6	Interview Techniques-Orientation	1. Various types of interviews 2. Types of interviews 3. Self-analysis 4. KYC sheet 5. Self-introduction	Open Source CDs Activity Based
7	Interview Techniques Practice Sessions	1. Video 2. Non-verbal communication 3. Types of interview questions	Open Source CDs Activity Based
8	Interview Techniques-Mock Interviews Optional Practicals	1. Mock Interviews (One to One) Teacher can decide any other Practical apart from the ones mentioned below	Activity Based
9	Listening Skills	1. Listening Barriers	PPT Based, Activity Based
10	Non Verbal Communication	1. Kinesics in com/interviews 2. Activities/Role play	Open Source CDs PPT based
11	Use Figurative Language	1. Intro phrases/ Idioms/proverbs/ pronunciation	PPT Based, Activity Based

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code :PEP101 **Course: Sports/Yoga**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week **Total Credits : 00**

Course Outcomes

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

1. Understand fundamental skills and basic rules of games.
2. Gain health related physical fitness.
3. Develop body-mind coordination through games and yogasans.

BRIEF OBJECTIVES OF SPORTS/YOGA PRACTICAL CLASSES

It has long been proven that a healthy body leads to a healthy mind. With a strong belief in this, Physical Education department at RCOEM will conduct sports/yoga classes with the objective of maintaining health, fitness and wellness of students as well as create awareness about need for good health and physical fitness. The objective would also be todevelop team spirit, social skills as well as identify and develop leadership qualities in students through various sports group activities. Training of students to understand the rules of various national and international games would also be an important objective. Sport activities would also be conducted with the objective to provide recreation to the students which is an important neutralizer for stress. Additionally, the objective would be to evaluate fitness of students so as to recommend and conduct specific Yoga and Sport activities.

PROGRAMME OUTLINE

1. Sports

1. Introduction to sports i.e. volleyball, cricket, football, basketball, badminton, T.T., Athletics.
2. Health and safety issues related to sports; Knowledge, recognition and ability to deal with injuries and illnesses associated with sports.
3. Awareness about sports skills, techniques and tactics.
4. Rules, regulations and scoring systems of different games (Indoor & Outdoor).
5. Trials of students to participate in inter-collegiate/University level games.

2. Yoga: Includes asanas like sitting, standing and lying, Surayanamaskar, Pranayam.

3. Physical fitness test : this would include speed, Cardiovascular Endurance, strength, skill & flexibility.

Syllabus of Group 1 - Semester II and Group 2 – Semester II, Bachelor of Engineering

Course Code: MAT102 **Course: Engineering Mathematics-II**

L: 4 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits: 09**

Course Objective

The objective of this course is to expose student to understand the basic importance of Integral Calculus and Vector calculus. The student will become familiar with fitting of curves and regression analysis.

Course Outcomes

On successful completion of the course, student shall be able to

1. Understand and use the concepts of Integral Calculus for Engineering problems.
2. Apply technique of Vector differentiation and integration to various Engineering problems.
3. Know basic statistical techniques required for Engineering.

Syllabus

Unit-I:

Integral Calculus I: Beta and Gamma functions, Differentiation of definite integrals, Mean value and root mean square values.

Unit-II:

Integral Calculus II: Tracing of curves (Cartesian, polar and parametric curves), rectification of simple curve, quadrature, volumes and surface of solids of revolutions(Cartesian, polar and parametric forms).Theorem of Pappus and Guldin.

Unit-III:

Multiple Integrals and their Applications: Elementary double integrals, change of variable (simple transformation), change of order of integration (Cartesian and polar), application to mass, area, volume and centre of gravity (Cartesian and polar forms), elementary triple integrals.

Unit-IV:

Vector Calculus I: Scalar point function, Vector point function, vector differentiation, gradient, divergence and curl, directional derivatives with their physical interpretations, solenoidal and irrotational motions, Scalar potential function.

Unit-V:

Vector Calculus II: Vector integration: Line integrals, work done, conservative fields, surface integrals and volume integrals, Stoke's theorem, Gauss divergence theorem, Green's theorem and their simple applications.

Unit VI:

Statistics: Fitting of straight line, $y = a + bx$, parabola $y = a + bx + cx2$ and the exponential curves by method of least squares, Coefficient of linear correlation, lines of regression, rank correlation, multiple regression and regression plane of the type $z = a + bx + cy$, coefficient determination.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, Delhi
2. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India)
3. Advanced Engineering Mathematics, 2 ed, Jain, Iynger, Narosa publication.

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, Neekunj print process, Delhi.
2. Engineering Mathematics: Principal and Applications Srimanta, Paul, Oxford Univ Press,(2011).
3. Higher Engineering Mathematics: B.V. Ramana, TMH.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course No. CHT101 **Course : Engineering Chemistry**

L: 4 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits : 09**

Course Outcomes of Engineering Chemistry :

Upon successful completion of the course, the student shall be :

1. Able to understand the basic scientific principles underlying the troubles caused by impurities present in water and treatment to remove the same.
2. Understand the applications of different nanomaterials with their synthtic routes.
3. Able to characterize the fuels and analyze their combustion mechanism.
4. Able to understand the effect of constituents on quantity of cement manufactured with their setting and hardening reactions.
5. Able to understand principles of lubrication along with chemical properties of lubricants.
6. Knowledge of proper engineering materials having better corrosion resistance and sustainability and implement the effective measures to minimize the corrosion wherever possible.

Syllabus

Water Treatment :

Water Treatment for Industrial Applications: Brief introduction regarding sources, impurities in water, hardness of water and their types. Softening of water using lime-soda process: principles in hot and cold lime-soda process. Zeolite softener, demineralization by synthetic ion exchange resins. Boiler troubles: Carryover, Priming and Foaming, Scales and Sludges, Caustic Embrittlement, Boiler Corrosion-causes and effects on boiler operation and methods of prevention. External and Internal conditioning : Phosphate, Carbonate and Calgon conditioning.

Water Treatment for Domestic Water:

Domestic water treatment : Brief discussion and Chemistry involved in the process of sedimentation, coagulation, filtration and sterilization by UV, Ozone, Chlorination including Break point chlorination. Desalination of water using reverse osmosis and electro dialysis.

Numericals Based on Water Softening: Numericals based on (1) lime-soda (2) zeolite / ion-exchange water treatment processes.

Cement :

Process parameters involved in the manufacturing of portland cement, manufacture of portland cement, microscopic constituents of cement and their effects on strength; setting and hardening of cement.

Types and uses of cement : Pozzolonic; Rapid hardening, Low heat and High alumina cements. Additives and admixtures used in cement: Accelerators, Retarders, Air entrainment agents, Water repellants.

Chemical approach to Nanomaterials :

General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, medical applications, catalysis, environment and cosmetics.

Physical chemistry related to nanoparticles such as colloids and clusters: conductivity and enhanced catalytic activity compared to the same materials in the macroscopic state.

Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method .

Carbon nanotubes: Single-walled and multi-walled carbon nanotubes, their structures, properties and applications.

Potential risks of nanomaterials- Health and environmental impact.

Fuels and combustion :

Introduction, Calorific value, Higher and Lower calorific value, flame temperature and flame intensity , determination of calorific value by Bomb calorimeter and Boy's calorimeter, numericals based on the determination of calorific value by Bomb and Boy's Calorimater.

Solid Fuels:

Types of coals, proximate and ultimate analysis of coal, its significance, Carbonization of Coal.

Liquid and Gaseous Fuels:

Liquid fuels: mining & fractional distillation of crude petroleum, use of gasoline in internal combustion engine, octane number, cetane number, flash point of combustible liquid fuel, knocking. Fisher-Tropsch's process for manufacture of synthetic gasoline, thermal and catalytic cracking: fixed bed and fluid bed catalytic cracking, aviation gasoline.

Gaseous fuels:

CNG and Significance of flue gas analysis by Orsat apparatus.

Numericals based on Combustion Calculations:

Numericals based on combustion calculations for solid fuels. Numericals based on combustion calculations for liquid and gaseous fuels.

Friction, Wear and Lubricants :

Introduction, lubrication mechanism : Hydrodynamic, Boundary and Extreme pressure lubrication. Classification of lubricants- Solid, Semisolid and Liquid lubricants, Blended oils using different additives viz.:-

Anti-oxidants, E. P. additive, corrosion inhibitor, viscosity index improver, etc. synthetic lubricants viz.:- Dibasic acid esters, Polyglycol ethers and Silicones, Lubricating Emulsions. Properties of Greases: Drop point and consistency test, Properties of liquid lubricants: Viscosity and Viscosity Index, Aniline point, Cloud & Pour point and Decomposition stability. Criteria for selection of lubricants under different conditions of load and speeds.

Corrosion :

Electrochemistry and Theories of Corrosion :

Introduction to corrosion, Cause and Consequences of corrosion, Measurement of corrosion rate, Galvanic series, Dry and Wet corrosion, Pilling-Bedworth rule, factors affecting the rate of corrosion.

Types of corrosion and Preventive Methods; Different types of corrosion (Pitting, Stress, Intergranular and Galvanic), protection against corrosion, design and selection of engineering materials, cathodic and anodic protection, Brief discussion about Protective Coatings: Metallic, Inorganic, Organic coatings, Corrosion inhibitors.

Text Books :

1. Text Book of Engineering Chemistry, S. S. Dara, S. Chand and Company Ltd., New Delhi.
2. Textbook of Engineering Chemistry, P. C. Jain and Monica Jain, Dhanpat Rai and Sons, New Delhi.
3. Text Book of Environmental Chemistry and Pollution Control, S. S. Dara; S. Chand and Company Ltd., New Delhi.
4. Textbook of Engineering Chemistry, S. N. Narkhede, R. T. Jadhav, A. B. Bhake, A. U. Zadgaonkar, Das Ganu Prakashan, Nagpur.
5. Applied Chemistry, A. V. Bharati and Walekar, Tech Max Publications, Pune.
6. Engineering Chemistry, Arty Dixit, Dr. Kirtiwardhan Dixit, Harivansh Prakashan, Chandrapur.

Reference Books :

1. Engineering Chemistry by Gyngell, McGraw Hill Publishing Company, New Delhi.
2. Engineering Chemistry (Vol I), Rajaram and Curiacose, Tata McGraw Hill Publishing Company, New Delhi.
3. Engineering Chemistry (Vol II), Rajaram and Curiacose, Tata McGraw Hill Publishing Company, New Delhi.
4. Engineering Chemistry, Saraswat and Thakur, Vikas Publication, New Delhi.
5. Engineering Chemistry, B. S. Sivasankar, Tata Mcgraw Hill Publishing Company, New Delhi.
6. Engineering Chemistry, O. G. Palan, Tata Mcgraw Hill Publishing Company, New Delhi.
7. Engineering Chemistry, R. Shivakumar, Tata Mcgraw Hill Publishing Company, New Delhi.
8. Chemistry of Cement, J. D. Lee, Mcgraw Hill Publishing Company, New Delhi.
9. Nanomaterials Chemistry, C. N. R. Rao, A. Muller, A. K. Cheetam, Wiley VCH verlag GmbH and Company, Weinheim.

Syllabus of Group 1 - Semester I and Group 2 - Semester II, Bachelor of Engineering

Course Code : CHP101 **Course: Engineering Chemistry Lab**

L:0 Hr., T:0Hrs., P:3 Hrs., Per week **Total Credits : 03**

Course Outcomes of Engineering Chemistry Lab

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

1. Be conversant with various chemical processes involved in qualitative as well as quantitative analysis of different materials, water pertaining to various impurities and to record the information in the scientific way.
2. Understand applicability of different physico-chemical properties of fluids such as viscosity and flash point for various industrial machineries.

Text Books :

1. Text Book on Experiments and Calculations in Engineering Chemistry: S. S. Dara; S. Chand and Company Ltd., New Delhi.
2. Practical Engineering Chemistry : S. N. Narkhede, R. T. Jadhav, A. B. Bhake, A.U. Zadgaonkar, Das Ganu Prakashan, Nagpur.

Reference Books :

1. Concise Laboratory Manual in Engineering Chemistry: R. Shivakumarand J. Prakasan, Tata McGraw Hill Publishing Company, New Delhi.

Syllabus of Group 1 - Semester II and Group 2 - Semester I, Bachelor of Engineering

Course Code: CET101 **Course: Engineering Mechanics**

L:3 Hr., T:1 Hrs., P:0 Hrs., Per week **Total Credits : 07**

Course Outcomes

After Completion of the course in Engineering Mechanics, the student should be able to

1. Define and Describe various parameters related to static and dynamic behaviour of the rigid bodies.
2. Understand and describe physical phenomenon with the help of various theories.
3. Explain and analyse various physical phenomenon with the help of diagrams.
4. Describe and analyse the engineering problems with the acquired knowledge of engineering mechanics

Syllabus

Unit-I:

Fundamental of Engineering Mechanics:

Fundamentals of Engineering Mechanics, axiom's of mechanics, resultant of concurrent force system. Moment of a force, couples, resultant of non-concurrent force system

Unit-II:

Equilibrium of Force System :

Equilibrium of concurrent force system, Equilibrium of non-concurrent force system Friction: Law's of friction, simple application, wedge friction, belt friction.

Unit-III:

3-D Force system & Analysis of trusses :

Moment of a force about a point and about an axis, resultant of spatial concurrent & Non concurrent force system, wrench, equilibrium of concurrent and non-concurrent force system. Analysis of simple trusses (Joint & Section Method)

Unit-IV:

Centroids and moment of inertia :

Centroids locating by first principle, centroid of composite areas, Second moment and product of inertia of plane areas. Moment of Inertia of composite areas. Transfer theorems for moment of Inertia and Product of Inertia.

Virtual work method

Virtual work principle, application of virtual work principle.

Unit-V

Kinematics & Kinetics of Particles :

Rectilinear motion of a particle with variable acceleration, Projectile motion, normal and tangential components of acceleration, kinetics of particle and several interconnected particles. D'Alembert's principle, problems on connected system of particles.

Unit-VI:

Collision of elastic bodies:

Principle of conservation of momentum, Impulse momentum equation, work energy equation, coefficient of restitution, impact of elastic bodies.

Text Books:

1. Engineering Mechanics: F. L. Singer, Harper & Row Publications.
2. Fundamentals of Engineering Mechanics : A.K. Sharma, Sai Publications.
3. Engineering Mechanics :A.K.Tayal, Umesh Publications, New Delhi.
4. Engineering Mechanics : P.B. Kulkarni, Professional Publishing House Pvt. Ltd.

Reference Books:

1. Engineering Mechanics: Timoshenko & Young, Tata McGraw Hill Publications, New Delhi.
2. Engineering Mechanics: Bear and Johnston, Tata McGraw Hill Publications, New Delhi.
3. Engineering Mechanics: I. H. Shames, Phi Pvt. Ltd., India.

Syllabus of Group 1 - Semester II and Group 2 - Semester I, Bachelor of Engineering

Course Code : CEP101 **Course : Engineering Mechanics Lab**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week **Total Credits : 02**

Course Outcome

After Completion of the course in Engineering Mechanics Lab; the student should be able to

1. Define and explain different terminologies of simple lifting machines.
2. Understand and perform practicals on equilibrium of concurrent and non-concurrent force systems.
3. Describe various terminologies related to friction and mass moment of inertia.
4. Explain graphical solutions of equilibrium conditions in engineering mechanics.
5. Analyse the experimental data collected based on practicals and discuss the results.

Minimum of Eight Practical will be performed based on the theory

List of Experiment

Experiments On"Simple Lifting Machines"

1. Law of machine for Differential Axle and Wheel
2. Law of machine for Single Purchase Crab
3. Law of machine for Double Purchse Crab

Experiments On"Equilibrium of force systems"

4. Jib Crane (Equilibrium of concurrent Forces)
5. Simple Beam (Equilibrium of Non-concurrent Forces)
6. Shear Leg Apparatus(Equilibrium of 3-D concurrent forces)

Experiments On"Friction & Inertia"

7. Inclined Plane (Coefficient of friction using Inclined Plane)
8. Belt Friction(Coefficient of friction using coil friction set-up)
9. Fly-Wheel (Mass moment of Inertia of fly-wheel)

Graphical Methods in Engineering Mechanics

10. Resultant of concurrent force systems
11. Resultant of Non-concurrent force system
12. Reactions for simply supported beams
13. Forces in members of simple Trusses
14. Moment of Inertia (Mohr's Circle)

Syllabus of Group 1- Semester II & Group 2- Semester I, Bachelor of Engineering

Course Code: MET101 **Course : Engineering Drawing**

L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits: 06**

Course Outcomes : The expected learning outcome is that, the students shall be able to :

1. Draw & interpret technical drawings.
2. Convert 2-D drawing to 3-D drawing & vice-versa.
3. Represent the various positions of planes & solids in different orientations.
4. Develop the solid surface for sheet metal working.

Syllabus (Only First Angle Method of Projection)

UNIT 1

Introduction: Lines, Lettering & Dimensioning, Preparation of Sheet Layout.

Scales - Plain Scale, Diagonal Scale, Vernier Scale.

Engineering Curves; Ellipse: Directrix Focus, Concentric Circles & Rectangle Method.

Parabola: Directrix Focus, Rectangle Method, Tangent Method.

Hyperbola: Directrix Focus & Asymptote Method.

UNIT 2

Theory of Projections - Concept of Projection, First & Third angle projection methods.

Orthographic Projections: Conversion of given 3 dimensional View to 2 dimensional representation.

UNIT 3

Projections of Lines: Oblique Lines, Traces, Applications of lines.

UNIT 4

Projections of Planes - Polygonal Lamina, Circular Lamina.

Projections of Solids- Cube, Prism, Pyramid, Tetrahedron, Cylinder, Cone.

UNIT 5

Sections of Solids & Development of Lateral Surfaces- Cube, Prism, Pyramid, Tetrahedron, Cylinder, Cone.

UNIT 6

Isometric Projections: Isometric Scale, Conversion of given 2 dimensional views to Isometric Projection/View.

Books:

1. Engineering Drawing by N.D. Bhatt, Charotar Publishing House Pvt. Ltd.
2. Engineering Drawing by D. A. Jolhe, Tata McGraw Hill Publications
3. Engineering Graphics by H. G. Phakatkar, Nirali Publication.
4. Engineering Graphics by A. R. Bapat, Allied Publishers

References:

1. Engineering Drawing by R.K. Dhawan, S. Chand Publications
2. Engineering Drawing by K.L. Narayana & P. Kannaiah, SciTech Publication.

Syllabus of Group 1- Semester II & Group 2- Semester I, Bachelor of Engineering

Course Code: MEP101 **Course: Engineering Drawing Lab**

L: 0 Hrs. T: 0 Hrs. P: 3 Hrs. Per week **Total Credits: 03**

Course Outcome : The expected learning outcome is that, the students shall be able to:

1. Draw & interpret technical drawings.
2. Plan the sheet layout for the given drawing.
3. Convert 2-D drawing to 3-D drawing & vice-versa.
4. Represent the various positions of planes & solids in different orientations.
5. Develop the solid surface for sheet metal working.
6. Use & demonstrate drafting package.

List of Sheets: (50% of the sheets to be drawn in Auto CAD)

Sheet No.1: Engineering Scales & Curves

Sheet No.2: Orthographic Projections

Sheet No.3: Projection of Lines

Sheet No.4: Application of Lines

Sheet No.5: Projection of Planes

Sheet No.6: Projection of Solids

Sheet No.7: Section & Development of Solids

Sheet No.8: Isometric Projections

Books:

1. Engineering Drawing by N.D. Bhatt, Charotar Publishing House Pvt. Ltd.
2. Engineering Drawing by D. A. Jolhe, Tata McGraw Hill Publications
3. Engineering Graphics by H. G. Phakatkar, Nirali Publication.
4. Engineering Graphics by A. R. Bapat, Allied Publishers

References:

1. Engineering Drawing by R.K. Dhawan, S. Chand Publications
2. Engineering Drawing by K.L. Narayana & P. Kannaiah, SciTech Publication.
3. AutoCAD 14 for Engineering Drawing by P. Nageshwara Rao, Tata McGraw Hill Publications

Syllabus of Group 1- Semester II and Group 2-Semester I, Bachelor of Engineering

Course Code: HUT102 **Course:-Social Skills**

L:2 Hrs.,T:0Hrs.,P:0Hrs.,Per week **Total Credits:4**

Course Outcomes

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

1. Learn the basic concepts of personnel management or manpower planning and the process of recruitment and selection that they will go through as engineers.
2. Learn leadership skills, industrial relations, work organizations, and impact of industry on society.
3. Learn about the political systems and institutions working in India, laws and legislations affecting industry and the application of political principles like democracy in industry.
4. Learn the importance and application of Economics in Engineering.
5. Learn about culture/civilization and develop cross cultural capacity.
6. Learn about Personal, Professional and social ethics.

Syllabus

Unit-I:

Industrial Sociology:-

- Meaning and scope of Industrial Sociology
- Work Organization and its types.
- Concept of Leadership: Meaning, changing roles and its types.
- Concept of Power and Authority: Meaning, Importance, sources and Delegation
- Industrial Culture in India: Effects of Industrialization and Urbanization on Indian Society.

Unit-II:

Industrial Psychology:-

- Meaning and scope of Industrial Psychology
- Recruitment, Selection and Training
- Industrial fatigue
- Motivation, Theories of motivation: Maslow's Need Priority Theory, Macgregor's X And Y Theory, McClelland's Needs Theory
- Dealing with Self: Stress, health, and coping; interpersonal relationships; gender roles; environmental adjustments.

Unit-III:

Political Orientation:-

- Indian Constitution, features and federal structure.
- Fundamental rights
- Directive principles of state policy
- Industrial Democracy.
- Role of Bureaucracy in Modern Democratic states.

Unit-IV:
Economics:-

- Development of Indian Economy
- Infrastructure in the Indian Economy: Energy, power, transport system, road transport system, Rail-Road co ordination, water transport, Civil aviation, communication system, urban infrastructure, science and technology, private investment in infrastructure.
- Role of Public and Private sector in Indian Economy.
- Challenges before Indian Economy in 21st Century.
  Poverty, Unemployment, Corruption, Regional Imbalance, Growth of educational sector.

Unit-V:
Culture and Civilization:-

- Concept of Culture and Civilization.
- Study of engineering skills with special reference to Egyptian and Indus Valley Civilization.
- Role of Engineers as agent of change with specific reference to change in Indian Society during 20th and 21st century.
- Multiculturalism: Meaning, scope and significance especially in Indian context.

Unit-VI:
Ethics and social responsibility:-

- Personal and professional ethics
- Corporate social responsibility
- Social capital, social audit.
- Role of entrepreneurship in nation building.
- Developing scientific and humanitarian outlook for the welfare of nation and society.

Text Books :

1. A new look into Social Sciences by Sheikh and Shabbir
2. RuddarDatt and K.P.M.Sundharam, (67th Revised edition-2013), Indian Economy, S .Chand and Company Ltd, New Delhi.
3. Edmund G. Seebauer and Robert L Barry (2010 reprint) Fundamental of Ethics for Scientists and Engineers, Oxford University Press.

Reference Books:

1. P.C. Tripathi and P.N. Reddy, Principles of Management, (4th edition, 2008), Tata MacGraw Hill Publishing Co. Ltd., New Delhi
2. Martand.T. Telsang, Industrial and Business Management, (2001), S.Chand and Co. Ltd. New Delhi
3. Dr. V.H. Asudani: An Easy Approach To Social Science, (3rd edition, 2008), Astha Publication, Nagpur
4. Tariq Modood, Multiculturalism (Themes for 21st Century Series)(1st Publication 2007), Polity Press, Cambridge, U.K. ISBN-13:97807456-3288-9.
5. Social & Human Skills by Dr. Vinod Asudani and Dr. Monika Seth.

Syllabus of Groups 1- Semester II and Group 2 – Semester I, Bachelor of Engineering

Course Code : INP102 **Course: Workshop**

L: 0 Hr., T: 0 Hrs., P : 02 Hrs., Per week **Total Credits : 02**

Course Objectives :

To impart practical training (hands-on experience) regarding use and operations of various tools, equipment and machine with basic knowledge of manufacturing process and materials.

Course Outcomes :

1. Student will be able to read job drawing, identity and select proper material, tools, equipments and process / machines for manufacturing the required job.
2. Student will be able to use basic marking and measuring instruments to inspect the job for confirming desired dimensions and shape.
3. Student will be able to observe and follow precautions during operation.

List of Experiments :

SHOP	No. of Experiments /Jobs
Fitting Shop	1. Introduction of fitting tools, equipments, machines, material & processes.
	2. Manufacturing & fitting practice for various joints & assembly.
	3. Drilling, tapping & pipe threading operations.
Carpentry Shop	1. Introduction of carpentry tools, equipments, machines, material & processes.
	2. Manufacturing of carpentry joints.
	3. Turning practice on wood working lathe.
	4. Demonstration & practice on universal wood working machine.
Welding Shop	1. Introduction of welding tools, equipments, machines, material & processes.
	2. Fabrication of joints like lap, butt, corner, T etc.
	3. Fabrication of lap joint by spot welding process.
Smithy Shop	1. Introduction of smithy tools, equipments, machines, material & processes.
	2. Forging of combine circular/square/hexagonal cross section.

Text Books :

1. Elements of workshop technology vol -1 by Hajra Choudhari
2. Elements of workshop technology vol -1 by Raghuwanshi

Reference Book:

1. Manufacturing technology by P.C. Sharma
2. Workshop manual by Kannaiah Narayan

THIRD SEMESTER

III Semester B.E. (Civil Engineering)

Course code: MAT 201 **Course: Engineering Mathematics-III**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

Upon successful completion of the course, the student shall be able to

1. Form mathematical modal corresponding to engineering problems by using Differential Equations and Matrices.
2. Solve related problems and analyze their physical and graphical interpretation by using Laplace Transforms.
3. Apply concepts partial differential equations, Numerical Methods in solving problems related to bending of beams.

Unit I :

Laplace Transform: Laplace transforms and their properties, Application of Laplace Transform to solve ordinary differential equations and simultaneous Differential equations, Application to one dimensional Partial Differential Equations.

Unit II :

Fourier Series And Partial Differential equations: Periodic functions and their Fourier expansion, even and odd functions, change of interval, half range expansion. Partial differential equation of first order first degree i.e. Lagrange's form, Solution of partial differential equation by separation of variables, Application to simple problems of vibration of strings & beams.

Unit III :

Functions of a Complex Variable: Analytic function, Cauchy integral theorem, Taylor and Laurent series

Unit IV :

Statistics and Probability: Introduction, Random variable : discrete and continuous, Probability function, Probability density function, probability distribution function for discrete and continuous random variable, Binomial, Poisson and Normal Distribution. Moment Generating Function, Mean and Variance of probability distribution

Unit V :

Matrices: Rank of matrix, consistency of system of equations, Linear dependence, linear and orthogonal transformations. Characteristics equations, Eigen values and Eigen vectors, Reduction to diagonal form, Cayley Hamilton theorem, Sylvester's theorem

Unit VI :

Numerical Methods: Errors in numerical calculations, errors in series approximation.

Rounding off errors, solution of algebraic and transcendental equations, Iteration method, False position method, Newton Raphson method and their convergence. Solution of system of linear equations, Gauss Seidal method, Crout's method .Numerical solution of ordinary Differential equation by Taylor's series method, Euler modified method, Runge Kutta method.

Text Books :

1. Higher Engineering Mathematics: B. S. Grewal, Khanna Publishers, Delhi (India)
2. Advanced Engineering Mathematics, 2nd ed: Jain, Iyengar , Narosa publication

Reference Books :

1. Advanced Engineering Mathematics: Erwin Kreyszig, 8th edition, Wiley, India, Delhi.
2. Introductory method of numerical analysis: S. S. Sastry, 4ed, PHI, New Delhi
3. Advanced Engineering Mathematics: H K Dass, S. Chand Publications.

III Semester B.E. (Civil Engineering)

Course code : CET 201 **Course: Strength of Materials**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

1. The students would be able to understand the behavior of materials under different stress and strain conditions.
2. The students would be able to draw bending moment, shear force diagram, bending stress and shear stress distribution for beams under the different conditions of loading.
3. The student would be able to apply knowledge to analyze concept of deflection, bending moment and shear force diagram in beams, and columns under various loading conditions using different analysis methods.

Unit I :

Mechanical Properties and Uniaxial Problems

Types of force distribution, concept of stress and strain, stress strain behavior of ductile and brittle material in uniaxial state of stress. Elastic, plastic and strain hardened zones stress-strain relations, elastic constants, relation between elastic constants.

Uniaxial loading and deformation of simple cases of statically inderminate problems under axial loading, temperature changes etc

Thin walled pressure vessels cylinder and spherical subjected to internal pressure.

Unit II :

Axial force, shear forces and bending moment diagram

Concept of free body diagrams, types of loads, determination of axial force, shear force and bending moment at a section. Axial forces, SF and BM diagrams in beams and simple frames, Relation between load and shear force and bending moment

Unit III :

Stresses in beams

Bending stresses in simple beams, assumptions and derivations of simple bending theory, relation between bending moment, bending stress and curvature, homogenous and composite beams

Shear stress in simple beams, shear flow and shear stress distribution.

Combined effect of BM and shear force.

Unit IV :

Torsion of shafts

Torsion of circular sections, assumptions and derivation of relations between torsional moment, shear stress and angle of twist, Torsional stress in solid circular sections, torsion in thin walled hollow sections closely coiled, helical spring, Leaf spring. Introduction of torsion in rectangular section

Unit V :

Deflection of beams and theory of columns

Derivation of differential equation of moment curvature relation, differential equation relating deflection and moment, shear and load, deflection of simple beams by double integration.

Buckling of columns and beam columns, Euler's and Rankine's formula

Unit VI :

State of stress in two dimensions, differential equation of equilibrium, transformation of stresses, principle stresses, maximum shear stress, Mohr's circle, combined axial and bending, combined bending and torsion, shear flow in thin walled sections, concept of shear center of thin walled section. Introduction to theories of failures

Text Books :

1. Mechanics of materials: Beer & Johnson, McGraw - Hill Publishers.
2. Strength of Materials, 4th ed.: A. Pytel and F. L. Singer, Harper & Row, New York.
3. Strength of Materials: G. H. Ryder - Macmillan, India.
4. Strength of Materials a Rudimentary Approach: M.A. Jayaram, Sapna Book House, Bangalore.

Reference Books :

1. Popov, E R. "Engineering Mechanics of solid", Prentice Hill of India, New Delhi, 2000.
2. Beer, Johnston, Dewolf. "Mechanics of Materials", Tata McGraw Hill, New Delhi, 2008.
3. Seely, F. B.; and Smith, J.O "Advanced Mechanics of Material", John Wiley and Sons. Inc.
4. S.S. Bhavikatti, Strength of Materials, 3rd Edition, Vikas Publishing House, 2008.

III Semester B.E. (Civil Engineering)

Course code : CEP 201 | **Course : Strength of Materials Lab**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week | **Total credits : 2**

Course Outcomes :

1. Students will be able to understand the importance of elastic properties of different metals.
2. Students will be able to know the behavior of different metals under different loading conditions such as tension, bending, torsion, shear etc and observe the failure pattern.
3. Students will be able to know the different properties of brick and their applications.

Practicals :

Minimum 10 of the following :

1. Study of elastic properties of metals.
2. Tension test on metals.
3. Compression test on metals.
4. Hardness test on metals.
5. Torsion test on metals.
6. Impact test on metals.
7. Deflection of springs.
8. Bending test on beams.
9. Bricks: absorption test, dimension test, crushing strength.
10. Verification of SFD and BMD by graphical solution.
11. Tiles test. Strength, water absorption and abrasion
12. Timber test. Strength and moisture content
13. Shear centre.

III Semester B.E. (Civil Engineering)

Course code: CET 202 | **Course : Fluid Mechanics - I**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit : 7**

Course Outcomes :

The students would be able to,

1. Understand and describe the fundamental fluid properties, Pressure and its variation and analyze the data / information by applying basic principles and appropriate concept of fluid mechanics.
2. Understand and describe the fundamental of kinematics and kinetic of fluid flow and apply the same for solving problems /analysis of kinematics and kinetic of fluid flow.
3. Understand the working of various equipments used for the measurement of fluid flow through pipe, open channel, tanks and analyze the problems associated with measurement of fluid flow.
4. Formulate dimensionally homogeneous equations for various fluid flow phenomenon considering various forces and parameters involved in it and its application for simple fluid flow problems.

Unit I :

Concepts of fluid, difference between solid, liquid and gases, basic properties of fluids, dynamic and kinematic viscosity, Newton's law of viscosity, vapor pressure, effect of pressure and temperature on fluid properties, rheological diagram.

Unit II :

Fluid pressure, Variation of fluid pressure with depth, pressure head, atmospheric, gage, vacuum pressure, relationship with diagram pressure measurement using simple and differential manometer, Hydrostatics pressure on plane surface, center of pressure, total pressure, Fluids in relative equilibrium, fluid masses subjected to horizontal, vertical and inclined acceleration Buoyancy and Floatation: Buoyant force and center of buoyancy, Archimedes principle, meta centre. Stability of floating bodies

Unit III :

Kinematics of flow: Velocity and its variation with space and time. Acceleration of fluid Particles, normal and tangential acceleration, Lagrangian and Eulerian approaches in fluid flow description, type of flows, stream line, path line, and streak line Equation of continuity in Cartesian co-ordinate systems, Stream function, velocity potential function, free and forced vortices, source, sink and circulation concepts

Unit IV :

Kinetic of fluid flow: Forces influencing motion, Eulers equations of motion and its derivation in Cartesian co-ordinate system and its integration to obtain Bernoulli's equation, Its application and limitations, Kinetic energy correction factor.

Unit V :

Measurement of discharge through pipes using Venturimeter, Orifice meter Measurement of velocity using Pitot tube, Orifice and Mouth piece- definition, types, Hydraulic coefficients. Large orifice and submerged orifice. External and internal mouthpiece, running free and running full Mouthpiece Notches and Weirs: Definition, types, End contraction, Coefficients of discharge. Velocity of approach and its effects, Cipolletti's weir, broad crested and submerged weirs.

Unit VI :

Dimensional analysis and model Dimensional analysis - Definition and use, fundamentals and derived dimensions, methods, dimensionless numbers Theory of model - Similitude, geometric, kinematic and dynamic similarities, Reynolds and Froude model laws & its significance

Text Books :

1. Hydraulics and fluid mechanics by Dr. P. N. Modi and S. M. Seth, 8th edition, Standard book house.
2. Introduction to fluid mechanics and fluid machines by S. K. Som and G. Bishwas, 2nd edition, Tata McGraw Hill Publishing Company.

Reference Books :

1. Fluid mechanics through problems by R. J. Garde, 2nd edition, Wiley Eastern Ltd.
2. Theory and Application of Fluid Mechanics by K. Subramanaya, 1st edition, Tata McGraw Hill Publishing Company.
3. Fluid Mechanics - Fundamentals and applications by Yunus cengel, John M Cimbala, Tata McGraw Hill Publishing Company ltd New Delhi, 7th reprint 2009.

III Semester B.E. (Civil Engineering)

Course code: CEP 202 **Course: Fluid Mechanics - I**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

The students would be able to,

1. Describe the process of experimentation. Handle and operate the equipments according to its working principle.
2. Determine the coefficients of equipments and interpret and discuss the experimental observations.
3. Analyze and compare the experimental and theoretical observations.
4. Plan and conduct the experiments in accordance with the objectives

List of Practicals

Minimum 8 of the following :

1. Determination of Hydraulic coefficients of Orifice.
2. Determination of coefficients of discharge of Mouthpiece.
3. Determination of coefficient of discharge of Rectangular Notch.
4. Determination of coefficient of discharge of Triangular Notch.
5. Determination of coefficient of friction for G I pipe.
6. Determination of minor losses for G I pipe.
7. Determination of coefficient of discharge for Venturi meter.
8. Determination of coefficient of discharge for Orifice meter.
9. Determination of Meta-centric height of ship model.
10. Verification of Bernoulli's Theorem.
11. Any other experiment employing self learning and other tools.

III Semester B.E. (Civil Engineering)

Course code: CET 203 **Course: Geotechnical Engineering - I**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

After completion of the course the students will be able to:

1. Identify and categorized the soil type and their relationship.
2. Determine various properties of soil.
3. Understand the various problems related to permeability and seepage through soil.
4. Measurement of strength parameters.

Unit I :

Introduction: Formation of soil, residual & transported soil, Major deposits found in India. Various type of soil, soil structure

Phases of soil: Various soil weight & volume inter-relationship.

Unit II :

Index properties: Classification of soils using various Index properties. Classification of course and fine grained soil based on Index properties.

Classification of Soil: Criteria of classification, particle size classification, Unified & I.S. classification system.

Unit III :

Permeability: Darcy's law & its validity, Discharge & seepage velocity, factors affecting permeability, Stresses in soil including Total Neutral and Effective total stresses and their estimation for soil stratification in soil mass, Determination of coefficients of permeability by laboratory and field methods, permeability of stratified soil.

Seepage: Laplace equation, method to draw flow nets, quick sand condition, characteristics & uses of flow nets, preliminary problems of discharge estimation for homogeneous soils.

Unit IV :

Stress Distribution: Stress distribution in soil mass, Boussinesq's theory, point load, uniformly loaded rectangular & circular areas, Newmark's charts

Unit V :

Compaction: Mechanics of compaction, factors affecting compaction, standard & modified proctor Tests, OMC, MDD, field compaction equipment, quality control, Deep compaction, Vibrofloatation

Consolidation: Terzaghi's 1-D consolidation theory, determination of coefficient of consolidation, degree of consolidation. Determination of pre-consolidation pressure, settlement and rate of settlement.

Unit VI :

Shear Strength – Concept of Mohr's stress circle, Mohr-Coloumb's theory, shear strength by direct shear test, tri-axial test, unconfined compression test, vane shear test, sensitivity.

Text Books :

1. Soil Mechanics in Theory and Practice: Alam Singh, Asia publisher and distributor, 1975 & later.
2. Basic and Applied soil Mechanics: Gopal Ranjan & A. S. Rao, New edge international Ltd.2004
3. Fundamentals of Geotechnical Engg. By B. M. Das, Cengage Publications.

Reference Books :

1. Soil Mechanics of By VNS Murthy
2. Geotechnical Engineering: Purushothama Raj, Tata McGraw Hill publishing Co. Ltd. 1995

III Semester B.E. (Civil Engineering)

Course code: CEP 203 **Course : Geotechnical Engineering - I**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit : 2**

Course Outcomes :

1. The students should be able identify the various types of soil
2. The students should be able to determine the various index properties of soil
3. The students should be able to find out various Engineering properties of soil.
4. The students should be able to use the various instruments to find out shear strength of soil.

List of Experiments :

Minimum 10 of the following:

1. Moisture content
2. Specific gravity of soil
3. Grain size Analysis - Sieve Analysis and Hydrometer
4. Atterberge limits
5. Permeability by constant head or falling head test
6. Proctors compaction Test
7. Field Density determinations by sand replacement method and core cutter method
8. Unconfined compression strength test
9. Direct shear Test
10. Triaxial compression test (Demonstration)
11. To find F.S.I. and D.F.S.I of soil. Identification of swelling soil
12. One field visit & its Report to be included in journal

III Semester B.E. (Civil Engineering)

Course code: CET 204 **Course: Engineering Geology**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

1. Identify, describe and explain the fundamental properties of soil, rocks and minerals.
2. Apply the basics and analyze the seismic free zones for safety of civil engineering structure
3. Asses the engineering geological project site suitability.
4. Collect tectonic, physiographic and hydro geological information of the area for various civil engineering structures.

Unit I :

General geology: Scope of engineering geology, internal structure of earth, continental drift and plate tectonics, isostacy and diastrophism. Principles of statigraphy, geological time scale, physiographic and tectonic divisions of India.

Geomorphology: Definition and scope, basic concepts, internal and external process, geological action of wind, running water and groundwater and their resulting landforms.

Unit II :

Mineralogy: Definition and classification of minerals, structure, chemical and physical Characters of mineral groups, olivine, Pyroxene, amphibole, feldspar, Mica.

Petrology: Rock cycle, Igneous Rocks, formation, textures and structures. Classification Sedimentary rocks, formation, classification, Metamorphic rocks, agents and kinds of Metamorphism, textures, structures, and classification of metamorphic rocks, grades of Metamorphism.

Unit III :

Structural Geology: Rock deformation, Attitude of rocks, mechanism of formation, Nomenclature, classification and field identification of fold, faults, unconformity. Effect on Outcrop, problems on borehole, dip strike thickness and depth of rock strata

Unit IV :

Surface and subsurface investigation methods, geophysical: Seismic, electrical, gravity, and magnetic

Volcanoes, types and their product, Earthquakes, causes and effects, magnitude and intensity, earthquake zones of India, Seismograms, elastic rebound theory, Landslides, causes and preventions.

Unit V :

Geohydrology: Occurrence, availability and movement of ground water, aquifer, aquitards, aquicludes and aquifuges, confined and unconfined groundwater, water table well, artesian well and flowing well, techniques of groundwater recharge, importance of groundwater study for various civil engineering projects.

Unit VI :

Engineering Geology: Application of geology to civil engineering projects, engineering properties of rocks, building stones, application of geology to location, design, and construction of dams, bridges and tunnels and building

Text Books :

1. Geology for engineers: FGH Blyth, ELBS/LPBB edition
2. A text book of Engineering Geology: Par bin Singh, S k kataria & sons, New Delhi.
3. Elements of Minerology: H. H. Read & Rutley's, Thomas murby & co.

Reference Books :

1. Principles of Petrology: G. W. Tyrrell, science paper backs.
2. Structural Geology: M. P. Billings. Prentice hall of India .New Delhi
3. A course in Mining Geology: R N P Arogyaswami, Oxford & I B H publication, New Delhi
4. Geological maps: Dr G W Chiplonkar
5. Engineering geology manual. : B.S. Satyanarayana Swami

III Semester B.E. (Civil Engineering)

Course code: CEP 204 **Course: Engineering Geology**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

The students should be able to

1. Read the detailed geological map and identify the appropriate rock/soil, their orientation required for mineral/oil and ground water exploration. Also analyze the structural discontinuities involved for taking care of civil engineering works. .
2. Collect bore-hole information from geomorphic maps for excavation of overburden.
3. Draft the specifications of various structural elements of underground strata.
4. Determine the physical/engineering properties of rocks/minerals for their utility in masonry works.

List of Practicals :

1. Megascopic study of rock forming and ore forming minerals
2. Megascopic study of rocks:
   a. Igneous Rocks.
   b. Sedimentary rocks.
   c. Metamorphic rocks.
3. Geological map and profiles.
4. Three point and dip strike problems.
5. Sketches of various types of folds, faults and joints.
6. Study of Clinometers compass in geological mapping.
7. Field visit to geological sites.

III Semester B.E. (Civil Engineering)

Course code: CHT 201 **Course: Environmental Studies - I**

L: 2Hrs, T: 0Hrs, P: 0 Hrs per week **Total credit: 0**

Course Outcomes:

1. Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. By studying environmental sciences, student is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
5. At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

Unit I :

Multidisciplinary Nature of Environmental Studies: Definition, scope and importance; Need for public awareness.

Unit II :

Natural Resources Renewable and Non-renewable Resources: Natural resources and associated problems. (a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. (b) Water sources: Use and over-utilization of surface and ground water, floods, drought, conflicts overwater, dams-benefits and problems. (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, water logging, salinity, case studies. (e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit III :

Ecosystems: Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers, and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids .Introduction, types, characteristic features, structure and function of the following ecosystem (Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems i. e. ponds, streams, lakes, rivers, oceans, estuaries)

Unit IV :

Biodiversity and its Conservation : Introduction - Definition: genetic, species and ecosystem diversity; Biogeographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Text Books :

1. Environmental Chemistry and Pollution Control: N. W. Ingole, D. M. Dharmadhikari, S. S. Patil, Das GanuPrakashan, Nagpur.
2. Environmental Chemistry: K. Bhute, A. Dhamani, A. Lonkar, S. Bakare, Celebration Infomedia, India.

Reference Books :

1. Text Book of Environmental Chemistry and Pollution Control: S. S. Dara; S.Chand and Company Ltd., New Delhi.
2. Environmental Studies-From Crisis to Cure, Second Edition:R. Rajagopalan, Oxford University Press, New Delhi.
3. Text Book of Environmental Studies: E. Bharucha, University Press (India) Private Ltd., Hyderabad, India

FOURTH SEMESTER

Course code : CET 205 **Course : Structural Analysis - I**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

1. The student would be able to analyze the determinate and indeterminate structures.
2. The student would be able to analyze field problems of structural analysis.
3. The students would be able to perform ILD analysis of determinate beams and trusses.

Unit I :

Conjugate Beam Method, Application to simply supported and overhanging beam, fixed beam, Analysis of continuous beams by three moment theorem

Unit II :

Moment Distribution Method applied to frames and beams (Non-Sway and Sway)

Unit III :

Influence Line Diagram for the reactions, S.F. and B.M. of the simply supported beams, cantilevers and overhanging beams, due to rolling loads.

Influence Line Diagrams for forces in the members of simple trusses.

Unit IV :

Concept of strain energy, Castigliano's theorem, Maxwell's reciprocal theorem and Betti's theorem, Deflections of determinate beams and frames, Strain Energy method as applied to redundant frames and redundant trusses up to two degrees.

Unit V :

Analysis of three hinged and two hinged parabolic arches. Normal thrust and Radial Shear Force calculations of arch.

Unit VI :

Slope deflection method as applied to indeterminate continuous beams and frames maximum indeterminacy up to two.

Text Books :

1. Ramamrutham S.S. and Narayan R., "Theorey of Structures", Dhanpat Rai and Son's, New Delhi.
2. Vazirani V. N. and Ratwani M. M., "Analysis of Structures", Khanna Publishers, New Delhi, 1994.
3. Bhavikatti S. S., "Structural Ananlysis (Volume II), Vikas Publishing House Ltd., Delhi.

Reference Books :

1. Pandit G. S. and Gupta S. P., "Structural Analysis", Tata McGraw Hills publishing company Ltd., New Delhi.
2. Timoshenko S. P. and D. H. Young, "Theory of Structures", Tata McGraw Hills publishing company Ltd., New Delhi.

   Hibbler R. C., "Structural Analysis", Pearson Education Ltd., Dorling Kindersley (India) pvt. Ltd

IV Semester B.E. (Civil Engineering)

Course code : CEP 205 **Course: Structural Analysis - I**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

1. Students will be able to understand the deflected shape of beams and frame and to learn their behavior.
2. Students will be able to identify the stress pattern from photo elastic approach.
3. Students will be able to understand the indeterminancy and learn to find the indeterminate reaction.
4. Students should observe the buckling shape of Column under various end conditions

List of Practicals :

Minimum 10 of the following:

1. To find slope & deflection of beams.
2. To find the value of Flexural Rigidity (EI) for a given beam & compare with theoretical value.
3. To find the moment required to produce a given rotation at one end a beam when the other end is
   i) Pinned ii) Fixed
4. To study the behavior of different types of struts and to calculate the Euler's buckling load for each case.
5. To verify the Maxwell's reciprocal theorem for beam.
6. Study of various types of strain gauges.
7. Plotting of influence lines by making use of Muller - Breslau principle.
8. Determination of deflection of trusses.
9. Determination of Material fringe value.
10. Determination of stress in the beam by photoelastic method.
11. To calculate horizontal deflection at roller end in two hinged arch.
12. To measure the strain in cantilever beam with help of electric resistance strain gauge.
13. To determine the horizontal thrust for indeterminate portal frames.
14. To study of Poloriscope.

To calculate and draw influence line diagram for horizontal reaction of two hinged arch.

IV Semester B.E. (Civil Engineering)

Course code : CET 206 **Course : Building Construction and Materials**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

On the completion of course, the students will able to:

1. Understand the role and importance of various building components
2. Examine various construction activities at the time of actual execution.
3. Know the properties of various construction materials.
4. Identify and select the quality materials for construction activities.

Unit I :

Building: Building components and its classification to NBC-2005. Foundations: Necessity and types of foundations. Details shallow foundations, Introduction to deep foundation. Loads on foundations, Causes of failures of foundations and remedial measures, Foundation on black cotton soil, Foundation trenches, excavation timbering of foundation trenches, Load bearing and framed structures, Simple numerical on design of footing for load bearing structures.

Unit II :

Brickwork: Qualities of good bricks, classification of bricks tests on bricks as per IS codes. Terms used in brickwork, commonly used types of bonds in brickwork (one brick thick only) such as header, stretcher, English and Flemish bonds, principles of construction, reinforced brickwork, brick knogging, Parapets, copings, sills and corbels, brief introduction to cavity walls, load bearing and partition walls. Masonry construction using cement concrete blocks, perforated bricks, paving, hollow blocks, fire clay bricks, AAC block.

Precast construction: introduction, advantages and comparison with conventional construction methods.

Unit III :

Stone Work : Selection of stones types of stone masonary, principles of construction, and joints in masonry. Lifting heavy stones, common building stones in India, artificial building stones, uses and application of stones, stone cladding

Pointing : Necessity and types of pointing

Arches and Lintels: Terminology in construction of arches and types, types chajjas and canopies. Pre cast lintels& Arches.

Plastering: Necessity, types and its procedure of construction.

Unit IV :

Floors : General principles, types and method of construction, upper floors finishes tiles - its characteristic, classification, Properties & application, Paver blocks.

Roofs : Introduction to Flat & Pitch roofs, new roofing materials, Thermal insulation.

Unit V :

Stairs: Types of stairs, functional design of stairs.

Introduction of Lift, Escalators and Ramps.

Doors and Windows: Purpose materials of construction and types.

Unit VI :

Temporary Timbering: Centering and form work shoring, underpinning and scaffolding.

Timber: Classification, structural, characteristics, defects and prevention.

Painting: White washing, colour washing and distempering new materials & Techniques.

Introduction to damp proofing, water Proofing - materials & techniques.

Heat and sound insulation

Text Books :

1. Building Construction: B. C. Punmia, Laxmi publication Pvt. Ltd. New Delhi and distributor, 1984 & later 2008
2. Building construction by Sushil Kumar, 16th Edition, Standard Publishers Distributors, 2006.
3. Building Construction Material by S.K. Duggal, 4th edition, New Age International, Reprint Nov. 2014

Reference Books :

1. Building Construction and Materials by Singh Gurcharan, Standard Publisher and Distributor, Standard Publishers Distributors, 2003
2. Alternative building Materials and Technologies: K. S. Jagdish & B. V. Venkatarama Reddy, New age international Publishers, 2007

IV Semester B.E. (Civil Engineering)

Course code : CET 207 — **Course : Environmental Engineering - I**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week — **Total credit : 7**

Course Outcomes :

The students would be able to,

1. Describe and explain the necessity of water treatment with the basic knowledge of various treatment processes and distribution methodology.
2. Understand and justify requirements of various components of water supply scheme for efficient operation and maintenance of the scheme.
3. Apply the knowledge of various principles, theories and equations in process analysis and in the design of various components of water supply scheme.
4. Explain and discuss the necessity and methodology of solid waste management.

Unit I :

Introduction: Importance and necessity of water supply scheme

Water Demand: Types of demand, factors affecting per capita demand, variation in demand, design period and population forecasting methods

Sources of water: Ground water sources & surface water sources

Intake structures: Location and its types

Unit II :

Conveyance of water: Types of pipes, joints, valves & fittings and testing methods of pipe lines

Hydraulic design aspects: Manning's, Darcy's, & Hazen-William's formulae

Rising main and pumps: Classification, working, merits, demerits and selection of pumps

Unit III :

Water quality: Physical, Chemical and bacteriological characteristics of water, environmental significance of various characteristics. Standards of drinking water, standards of packaged water and General idea of waterborne diseases

Water treatment: Objectives of treatment, unit operations and unit processes, treatment flow sheet of conventional & unconventional water treatment plant.

Aeration: Purpose, types of aerators and simple design of cascade aerator.

Unit IV :

Sedimentation: Principles, types of setting basins, inlet and outlet arrangements. Efficiency of settling basin

Coagulation and Flocculation: Definition, Principles, types of coagulants and reactions, coagulant doses, types of mixing and flocculation devices. Simple design of plain sedimentation or sedimentation with coagulation tank, Principles and operation of Clariflocculator

Filtration: Mechanism of filtration, types of filters-RSF, SSF, and Pressure filters. Operational problems in filtration, Simple design of RSF & SSF

Unit V :

Disinfection : Purpose, Mechanisms, criteria for good disinfectant, various disinfectants and their characteristics, disinfection by chlorination using different forms of chlorine

Distribution systems: Requirements for a good distribution system, methods of distribution systems and layouts of DS.

Storage reservoirs for treated water: Types, capacity of reservoir, mass curve method.

Miscellaneous water treatment methods

Unit VI :

Municipal solid waste management: General introduction about solid waste management.

Generation, sources, composition, quality, methods of collection, transportation, treatment and disposal

Text books :

1. Water supply & Sanitary Engineering Vol. I : B. C. Punmia (Laxmi Publication),
2. Water supply & Sanitary Engineering : G. S. Birdie (Dhanpat Rai Publication)
3. Environmental Engg. Vol. I: S. K. Garg (Khanna publication.)

Reference books :

1. Water Supply and Sewerage By M. J. Mc Ghee (McGraw Hill)
2. Water Supply Engg. By P. N. Modi (Standard Book House)
3. CPHEEO Manual of water supply & treatment.

IV Semester B.E. (Civil Engineering)

Course code : CEP 207 | **Course : Environmental Engineering - I**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week | **Total credit: 2**

Course Outcomes :

The student would be able to:

1. Determine the various characteristics of water.
2. Understand the significance of various characteristics of water along with the knowledge of drinking water standards and necessity of water treatment.
3. Identify the type of treatment required for a given water sample to make it suitable for drinking.
4. Understand various instruments and methods used in water analysis.

List of Practicals :

Minimum 10 of the following:

1. Determination of pH
2. Determination of Conductivity
3. Determination of Chlorides
4. Determination of Solids
5. Determination of Turbidity
6. Determination of Alkalinity
7. Determination of Dissolved Oxygen
8. Determination of Hardness
9. Determination of Available Chlorine in bleaching powder
10. Determination of Residual Chlorine
11. Jar Test
12. Determination of acidity
13. Study practical of MPN and plate count tests.
14. Study practical of BOD test.

IV Semester B.E. (Civil Engineering)

Course code: CET 208 **Course : Concrete Technology**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

1. The students should be able to identify and select different constituent of concrete.
2. The students should be able to illustrate and control method of manufacture of concrete.
3. The students should be able to analyze various environmental factors which affect durability of concrete.
4. The students should be able to design and recommend the mix of concrete for given materials.
5. The students should be able to design concrete component by working stress method.

Unit I :

Constituents of concrete

Ordinary Portland cement, hydration of cement, testing of cement, field test, fineness test, initial and final setting of cement, soundness test, compressive strength test

Aggregates, classification, testing of aggregate, particle shape, size & grading of aggregate, water absorption, moisture content of aggregate, bulking of sand, Alkali aggregate reaction

Introduction to crushed sand and recycled aggregates, Additives for producing: Rapid Hardening Cement, G. G. Blast furnace slag cement, Low heat cement,

Portland pozzolana cement, Sulphate resisting cement, High alumina cement, Water as a constituent of concrete.

Admixtures used for modification in workability, bond strength, setting time, water resistance, impermeability

Unit II :

Plastic concrete

Manufacturing process of concrete: batching, mixing, transporting, placing, compacting, and finishing Concreting equipments: Weigh batcher, mixers, transportation equipments, vibrators, and batch mix plant. Workability: Factors affecting it, Testing of workability of concrete: Slump test, Compaction factor test, flow table, vee-bee consistometer. Curing of concrete: Necessity, Methods, duration and frequency of curing, Maturity of concrete

Unit III :

Strength of concrete

Gain of strength of concrete, water cement ration law.

Destructive test: Compressive strength, factors affecting it, determination of compressive strength, cube strength & cylinder strength, accelerated curing test.

Tensile and flexural strength: Significance and testing, indirect tension test, cylinder splitting test, centre point and third point loading method.

Non-destructive test: Significance, surface hardness test, pulse velocity method, semi destructive tests, x ray method, neutron tomography method.

Introduction of High Strength Concrete, Interfacial transition zone (ITZ)

Unit IV :

Mix Design

Statistical parameters of quality control

Factor affecting mix proportions

Method of mix design by IS: 10262- 1982 and IS: 10262-2009

Numericals based on IS method

Unit V :

Failure modes in concrete

Failure in plastic concrete: Segregation and bleeding

Failure in hard concrete: Cracks and their causes, failure of bond between concrete & reinforcement

Shrinkage: Mechanism of shrinkage, types, Factor affecting it.

Creep: Factors influencing relation between creep & time, effect of creep.

Unit VI :

Permeability of concrete Sulphate attack, sea water attack, acid attack, efflorescence, corrosion of reinforcement, abrasion and cavitation

Concept of durability of concrete

Working stress method

Introduction to the working stress method of RCC design, Basic concept in design for flexure, assumptions, formulation of design constants

Analysis of the rectangular section, Balanced, under- reinforced and over-reinforced sections, Analysis and design of rectangular section

Limitations of Working stress method

Text books :

1. Properties of concrete. By A.M. Neville, E.L.B.S. London
2. Concrete Technology by M. S. Shetty. Published by S. Chand, Faridabad

Reference Books :

1. Concrete Technology (Theory and practice) by M L Gambhir, McGraw hill publications, Fifth edition.
2. Concrete Technology by Santhakumar, Oxford publication, New Delhi
3. Reinforce concrete design by Pillai and Menon, McGraw Hill
4. Chemistry of cement & concrete by lea

IV Semester B.E. (Civil Engineering)

Course code : CEP 208 **Course : Concrete Technology**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit : 2**

Course Outcomes :

1. The students should be able to test various constituents of concrete.
2. The students should be able to interpret the quality of material.
3. The students should be able to analyze various properties of fresh and hardened concrete.

List of Practicals:

Minimum 10 of the following

Test on Cement:

1. Determination of fineness of cement
2. Determination of Normal consistency.
3. Determination of setting time.
4. Determination of soundness.
5. Determination of compressive strength.

Test on Aggregate:

6. Determination of particle shape. Elongation and Flakiness index of aggregates.
7. Determination of finess modulus of aggregate and drawing particle size distribution curve.
8. Determination of water absorption and moisture content.

Test on concrete :

1. Determination of workability by slump test
2. Determination of workability by compaction factor test
3. Determination of workability by flow test
4. Determination of workability by Vee-bee test.
5. Determination of strength by cube strength of concrete
6. Determination of strength by N D T: Rebound hammer test, ultrasonic pulse velocity test.
7. Determination of cover by covermeter.

IV Semester B.E. (Civil Engineering)

Course code: CET 209 **Course : Surveying - I**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

The students will be able to

1. Use techniques and skills for linear and angular measurements by using various instruments and do temporary and permanent adjustments of instruments.
2. Identify meaning of linear and angular observations and will be able to describe the topography and setting out works.
3. Work as a team member and apply knowledge to draw plans and maps.
4. Demonstrate knowledge for calculation of areas and volumes of the earth work.
5. Exhibit knowledge to undertake various civil engineering surveys.

Unit I :

INTRODUCTION TO SURVEYING

Basic principles of Surveying, Different types of surveys, Perspective of chain surveying

COMPASS SURVEY: Basic terms and definitions –Bearing and angles- compass –types -Magnetic declination -Traversing - Local attraction

Unit II :

LEVELLING

Basic definitions, Dumpy level, Leveling staffs, Terms in Leveling, Methods of spirit leveling, Booking of readings, Balancing of sights, sensitivity of bubble tube, Reciprocal leveling, Use of Inverted staff, Auto level.

Unit III :

Permanent Adjustment of Dumpy level

CONTOURING: Contour characteristics, direct and indirect methods of contouring, uses, Trigonometric leveling

Unit IV :

PLANE TABLING

Plane table surveying-Plane table instruments and accessories- merits and demerits- methods

Intersection, - traversing – resection – Three point problem – Two point problem – Errors in plane tabling

Setting out works-introduction – Controls for setting Out – Horizontal Control – Vertical Control - Positioning of Structure.

Unit V :

THEODOLITE TRAVERSING

Vernier Theodolite, Basic definitions, Temporary and permanent adjustments, Selection and marking of stations for traversing, Measurement of horizontal and vertical angles, Optical Theodolites, Electronic Digital Theodolites

Traverse adjustment, computation of latitudes & departures, consecutive & independent coordinates, checks for open and closed traverses, Gales traverse table, omitted measurements. Global positioning System.

Unit VI :

Hydrographic surveying: – shore line measurement, soundings, three point problem Study of box sextant, clinometers, Planimeter- theory and use, Calculation of areas and volumes

Text Books :

1. Surveying and Leveling, Part I & Part II: Kanetkar, T.P., and Kulkarni,S.V., United book Corporation, Pune. 1998.
2. Surveying Vol. I & II: Dr. B.C. Punmia, Laxmi Publications, New Delhi.
3. Surveying Vol. I & II: Dr. S.K. Duggal: Tata McGraw Hill, New Delhi.

Reference Books :

1. Y. R. Nagraga & A. Veeraragavan; Surveying Vol. I, Nem Chand Bros., New Delhi
2. Dr. K.R. Arora, Surveying Vol. I & II Standard Book House, New Delhi

IV Semester B.E. (Civil Engineering)

Course code: CEP 209 | **Course: Surveying - I**

L: 0Hrs, T: 0Hrs, P: 3 Hrs per week | **Total credit: 3**

Course Outcomes :

1. The students will be able to
2. Exhibit knowledge to measure distance and angles.
3. Demonstrate the knowledge for preparation of plans and calculation of quantity.
4. Design and execute location, road and other survey works.
5. Demonstrate the ability of working in a group, communication skills and leadership qualities to accomplish timely completion of project

List of Practicals:

Minimum 8 of the following:

1. Measurement with chain and tape, ranging, offsets
2. Closed traverse by chain and compass and plotting
3. Plane table survey by radial method and calculation of area.
4. Plane table traverse survey by intersection method
5. Two point problem
6. Determination of elevation of various points by Height of collimation methods
7. Fixing bench mark by Fly levelling
8. Profile leveling and Cross sectioning for a road
9. Contour survey and plotting
10. Measurement of horizontal and vertical angles
11. Traversing by theodolite
12. Study of minor instruments
13. Determination of coordinates using GPS.

IV Semester B.E. (Civil Engineering)

Course code: CHT 202	**Course: Environmental Studies - II**
L: 2Hrs, T: 0Hrs, P: 2 Hrs per week	**Total credit: 0**

Course Outcomes :

1. Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. By studying environmental sciences, student is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
5. At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

Unit I :

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution, Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

Unit II :

Social Issues and the Environment: From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns, Case Studies; Environmental ethics: Issues and possible solutions; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case Studies; Wasteland reclamation; Consumerism and waste products; Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation; Public awareness.

Unit III :

Human Population and the Environment: Population growth, variation among nations, Population explosion - Family Welfare Programme; Environment and human health; Human Rights; Value Education; HIV/AIDS; Women and Child Welfare; Role of Information Technology in Environment and human health, Case Studies. Field work Visit to a local area to document environmental assets river/forest/grassland/hill/mountain; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study of simple ecosystems-pond, river, hill slopes, etc.

Text Books :

1. Environmental Chemistry and Pollution Control: N. W. Ingole, D. M. Dharmadhikari, S. S. Patil, Das Ganu Prakashan, Nagpur.
2. Environmental Chemistry: K. Bhute, A. Dhamani, A. Lonkar, S. Bakare, Celebration Infomedia, India.

Reference Books :

1. Text Book of Environmental Chemistry and Pollution Control: S. S. Dara; S. Chand and Company Ltd., New Delhi.
2. Environmental Studies-From Crisis to Cure, 2nd ed.: R. Rajagopalan, Oxford University Press, New Delhi.
3. Text Book of Environmental Studies: E. Bharucha, University Press (India) Private Ltd., Hyderabad, India.

FIFTH SEMESTER

V Semester B.E. (Civil Engineering)

Course code: CET 301 **Course : Steel Structures**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

On completion of course

1. Students will be able to explain the behavior and modes of failure of tension members and different connections.
2. Students will be able to analyze and design tension members, bolted connections, welded connections, compression members and beams.
3. Students will be able to design various steel structures.
4. Students will be able to develop skills to analyze and design a structure while working in a team

Unit I :

1. Steel as a structural material, various grades of structural steel, properties, various rolled steel sections (including cold formed sections, structural pipe(tube)sections) and their properties, Introduction to Plastic theory applied to beams and frames, shape factor, Introduction to IS 800:2007,808,816,875 etc.
2. Design of axially loaded members (a) tension members. (b) Compression members.
3. Design of roof truss, Load assessment for DL, LL and WL.

Unit II :

1. Structural Fasteners:

a. Behavior of bolted and welded connections (types, designations, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld, Efficiency of joints, Design of simple, bolted and welded connections. Moment resistant bolted and welded connection.

b. Design of connection: Beam to beam, beam to column: framed connection.

Unit III :

1. Design of simple and builtup beams, laterally restrained and unrestrained (symmetrical as well as unsymmetrical section).

Unit I V :

1. Design of welded plate girder, Curtailment of flange plates.
2. Design of single rolled steel section column subjected to axial load and uniaxial moment
3. Design of axially loaded rolled sections, built up columns, laced and battened, Column bases : slab base and gusseted base subjected to axial load and uniaxial moment.

Text Books :

1. Design of Steel Structures (By Limit State Method as per IS: 800-2007) , by Bhavikatti, Publisher: IK Books
2. Design of steel structures by N. Subramanian (Using IS: 800-2007) Publisher: Oxford University Press, India
3. Limit State Design of Steel Structuresby S. K. Duggal Publisher: Tata Mc Graw Hill
4. Limit State Design of Steel Strucutres : Based on IS: 800-2007 by Dr. Ramchandra, Virendra Gehlot Scientific Publishers
5. Design of steel structures by K. S. Sairam Publisher: Pearson Education

Reference Books :

1. Design of steel structures by Willam T Segui , CENGAGE Learning

V Semester B.E. (Civil Engineering)

Course code : CEP 301 **Course: Steel Structures**
L: 0 Hrs, T: 0 Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

1. Student will be able to analysis and design tension members, compression members, bolted, welded connections, beam.
2. Student will be able to develop analytical and design skills while working in a team.

Term Work :

Minimum two design assignments based on above topics along with the detailed structural drawings on A2 size sheets Practical Examination shall be based on the above Practical work.

V Semester B.E. (Civil Engineering)

Course code : CET 302 **Course: Environmental Engineering - II**
L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

The students would be able to,

1. Describe and explain the necessity of wastewater treatment with the basic knowledge of various treatment processes and disposal methodology.
2. Apply the knowledge of various principles, theories and equations in process analysis and in the design of various components of sewerage system.
3. Understand and explain various types of sanitary systems and its collection methodology along with the knowledge of other structures required for efficient operation and maintenance of the system.
4. Explain and discuss the sources, effects and control measures of air pollution and noise pollution.

Unit I :

General Aspects of Environmental Engineering: Classification of waste water, System of sanitation, separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water

Sewer: Types, Shapes, Hydraulic Design (Capacity, Size & Grade)

Unit II :

Construction of sewer - Procedure for laying of sewer to grade, testing of sewer line

Sewer Appurtenances - manhole, street inlets, storm water overflows, inverted syphons, flushing, ventilation, drop manhole, lamp hole and catch basin.

House plumbing systems - Ideal requirements of HPS, Types of HPS, sanitary fitting and appliances, types of pipes used in HPS, traps and its types, anti-syphonage.

Sewage pumping - location of pumping station and types of pumps.

Unit III :

Characteristics of sewage: Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, BOD equation and its application.

Sewage treatment: Sewage treatment flow sheet, site selection for sewage treatment plant, preliminary and primary treatment - Screens, Grit chambers, Primary settling tank (including simple design)

Unit IV :

Secondary treatment - Principle of Biological Treatment, Activated sludge process, trickling filter and SBR

Treatment of sludge: Sludge digestion, sludge drying beds.

Methods of effluent disposal - disposal by dilution, self purification of stream and oxygen sag curve. Disposal by land treatment

Unit V :

Rural sanitation : Pit privy, aqua privy, bio-gas recovery. Septic tank including soak pit, (including design problem) Sullage collection and disposal

Introduction to Industrial Waste Water Treatment : Significance of Industrial Waste Water Treatment, General idea about various unit operations and treatment processes like flow equalization, neutralization, adsorption, stabilization pond, aerated lagoon and oxidation ditch.

Unit VI :

Introduction to air pollution: Sources of air pollution and its classification, effects of air pollutants on man, animal, plant & materials. Global warming: its causes and effects. Meteorological parameters affecting dispersion of air pollutants, Plume behavior, various equipments used for control of air pollution

Introduction to Vehicular and Noise pollution

Text Books :

1. B. C. Punmia," Waste Water Engineering" - Laxmi Publication
2. G. S. Birdie, "Water Supply & Sanitary Engineering"- Dhanpat Rai Publishing Company (P) Ltd.

Reference Books :

1. S. K. Garg "Environmental Engineering Vol-II (Khanna Publication)
2. M. N. Rao & H. V. N. Rao, "Air 'Pollution" (Mc Graw Hill publication)
3. CPHEEO manual on sewerage and sewage treatment

V Semester B.E. (Civil Engineering)

Course code: CET 303 | **Course: Surveying - II**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit: 7**

Course Outcomes:

The students would

1. learn the use of tacheometer, subtense bar and total station
2. learn, analyze and evaluate types of curves, setting of horizontal and vertical curves, transition curves, triangulation, theory of errors and correction
3. learn and understand the basics of photogrammetry, astronomical surveying and Remote sensing and GIS
4. learn and demonstrate various surveys using tacheometer, theodolite, setting of curves, and total station

Unit I :

Tacheometric Surveying: Introduction, different systems of tacheometric measurements. Principal of stadia measurement, tacheometric equation for inclined sights, tangential method, subtense bar, anallactic lens, auto-reduction tacheometers.

Unit II :

Horizontal Curves

Simple circular curve: Elements of simple circular curve, designation of curve, setting out of simple circular Curve by different methods.

Compound curve: Elements of compound curve, Relation between the parts of a compound curve.

Reverse curve: Elements of a reverse curve, relationship between various parts of a reverse curve.

Unit III :

Transition curve: Introduction to transition curve, super elevation, length of transition curve, the ideal transition curve, characteristics of transition curve, setting out of transition curve.

Vertical curve: Introduction to vertical curve, length of vertical curve, computation and setting out a vertical curve.

Unit IV :

Triangulation surveying: Introduction, object, classification of triangulation system, triangulation figures, concepts of well-conditioned triangle, selection of stations, intervisibility and height computation of scaffolding, satellite station and reduction to centre, base line measurement.

Theory of errors: Introduction, principle of least squares, laws of weight, distribution of error of the field measurement, error adjustment by normal equations.

Unit V :

Photogrammetric Surveying

Terrestrial photogrammetry: Introduction, basic principles, photo-theodolite, horizontal and vertical angles, elevation of point,

Aerial photogrammetry: Introduction, definitions and nomenclature, scale of vertical photograph, computation of length of line, determination of height of lens for a vertical photograph. Relief displacement of a vertical photograph

Unit VI :

Astronomical survey: Astronomical terms, coordinate systems, terrestrial latitude and longitude, elements of spherical trigonometry.

Remote Sensing and GIS: Introduction, principles, applications.

Introduction to: EDM, Total station, GPS.

Text Books :

1. Surveying: Vol.I and Vol. II by Dr. B.C. Punmia, Laxmi Publication- New Delhi.
2. Surveying and Levelling Vol. II by T.P. Kanetkar and S.V. Kulkarni, Pune Vidyarthi Publication.
3. Surveying- Vol. II and III by Dr. K.R. Arora Standard Book House.
4. Advanced Surveying- Total station, GIS and Remote Sensing by Satheesh Gopi. R. Sathikumar and N. Madhu, Pearson publication.49

Reference Books :

1. Textbook of Surveying by C. Venkataramaih, Publisher: Orient Blackswan
2. Surveying and Levelling (vol I & II) by S. S. Bhavikatti, I K International Publishing House Pvt. Ltd
3. Higher Surveying by Dr A.M. Chandra, New Age International
4. Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi
5. Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi
6. Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
7. Remote sensing and Image interpretation by T.M Lillesand, R.W. Kiefer,. And J.W Chipman, 5th edition, John Wiley and Sons India

V Semester B.E. (Civil Engineering)

Course code: CEP 303	**Course: Surveying - II**
L: 0Hrs, T: 0Hrs, P: 2 Hrs per week	**Total credit: 2**

Course Outcomes :

1. The students will be able find the R.L. of the stations by using Trigonometric method.
2. The students will be able to find the horizontal, vertical distance and R.L. of the station points by Tachometric method.
3. The students will be able to set the horizontal and vertical curves.
4. The students will be able to take up detailed survey project and prepare maps, cross-sections, contour maps and L-stations.

List of Practicals :

1. **Minimum 6 of the following:**
    1. Determination of height and distance when the Instrument station is in the same vertical plane.
    2. Determination of height and distance (Base of the object inaccessible) – when the instrument station is not in the same vertical plane.
    3. Determination of Tachometer constants, distance and elevation by stadia method.
    4. Contouring by tachometric method.
    5. Setting out simple circular curve by linear method.
    6. Setting out simple circular curve by angular method.
    7. Determination of True North by astronomical survey
    8. Demonstration of EDM, Total Station.
    9. One Practical based on use of Total Station.

2. Survey camp: On any of following for minimum three days

- Road Project
- Irrigation Project
- Water Supply Project

V Semester B.E. (Civil Engineering)

Course code : CET 304 **Course : Transportation Engineering - I**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcome :

After the completion of the course in Transportation Engineering-I, the student should be able to:

1. Define and describe different objectives and requirements of Highway Development and Planning, Alignments and Tests on Highway materials.
2. Explain, Discriminate and Design various Geometric Features of Highways.
3. Describe, Summarize, interpret, distinguish, appraise and design the components of Pavements.
4. Memorize, explain, illustrate and evaluate the parameters of Traffic Engineering
5. Define, Discuss, differentiate and interpret the various components of Bridge Engineering.

Unit I :

Highway Development & Planning : Principles of Highway planning, Road development in India, Classification of roads, network patterns, Planning, Surveys.

Highway Alignment: Requirements, Engineering Surveys.

Highway Materials: Properties of sub grade and pavement component materials, Tests on sub grade soils, aggregates and bituminous materials. Application of Geosynthetics

Unit II :

Highway Geometric Design : Cross Section elements, carriageways, camber, stopping & overtaking sight

Distances, Horizontal alignment- Curves, design of super elevation, widening, transition curves, vertical curves.

Unit III :

Pavement Design : Types of pavements & characteristic, Design parameters, Axle & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & IRC method of flexible pavement design. Analysis of load &temperature stresses of rigid pavement, joints

Highway Construction & Maintenance: Equipment and Machineries, Earthen/Gravel road, Water Bound Macadam, Wet Mix macadam, Bituminous pavement, Cement Concrete pavement. Pavement failures, Pavement evaluation, Maintenance and strengthening measures

Unit IV :

Traffic Engineering : Traffic characteristics (Road User, Driver and Vehicular characteristics)

Traffic Studies (Volume studies, speed studies, parking studies and accident studies)

Traffic Safety (Causes and types of accidents, Use of intelligent transportation system)

Unit V :

Bridge Engineering: Classification, identification and site selection

Flood discharges, waterways, scour depth, economic span.

IRC classification of Loads, Forces, Stresses: IRC Specification & code of practices, Critical combinations.

Unit VI :

Sub-Structure: Types of foundations & their choice, Open, Pile and well foundation, pneumatic Caissons, cofferdams. Abutment, Piers & Wing walls, their types general design principles (empirical.)

Super Structure: Different structural forms

Rating and Maintenance: Methods & Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion-causes and prevention, Aesthetics.

Text Books :

1. Highway Engineering: Khanna and Justo.
2. Bridge Engineering: S. P. Bindra.
3. Bridge Engineering: S. C. Rangwala.
4. Principles and practices of Highway Engineering: S. K. Sharma

Reference Books :

1. Pavement Design: Yoder and Witzak.
2. Highway materials: Kerb and Walker.
3. Traffic Engineering: L.R.Kadiyali.
4. IRC Codes

V Semester B.E. (Civil Engineering)

Course Code : CEP 304 **Course : Transportation Engineering - I**

L: 0 Hrs, T: 0Hrs, P: 2 Hrs per week **Total credits : 2**

Course Outcomes :

Upon completion of this course, the students:

1. Will be able to perform various engineering quality control test on soil samples.
2. Will be able to perform various engineering quality control test on stone aggregate samples.
3. Will be able to perform various engineering quality control test on tar and bitumen samples.
4. Will have sufficient knowledge about the data collection, methods, and field tests that are to be performed in Highway and Traffic Engineering.

List of Practicals :

Minimum 10 of the following :

1. Sub grade Soil: CBR test
2. Sub grade Soil: AASHO Classification
3. Aggregates: crushing value test.
4. Aggregates: Los Angeles abrasion value test.
5. Aggregates: impact test.
6. Aggregates: shape test.(Elongation Index, Flakiness index and Soundness test)
7. Aggregates: Specific Gravity and Water absorption test.
8. Bitumen: Penetration Value.
9. Bitumen: Ductility Test.
10. Bitumen: Softening point test.
11. Bitumen: Flash and Fire point test.
12. Bitumen: Specific gravity.
13. Bitumen: Adhesion Test.
14. Short Field Visit

V Semester B.E. (Civil Engineering)

Course code: CET 305 **Course: Building Design and Drawing**

L: 1Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 3**

Course Outcomes :

Upon completion of this course, the students will be able to:

1. Plan the residential building and public building.
2. Prepare the submission drawing & working drawing of residential building.
3. Develop the perspective view of single storey building.

Unit I :

Introduction: Importance of Building drawing as Engineer's Language in construction & costing. Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962, 1967.

Study of composition of working drawing and submission drawing of existing structures

Study of structural drawing of various R.C.C. elements like footing, beam, column, slab, water tank etc

Unit II :

Study of building site requirements, requirements of owner, local bye-laws and Principles of planning

Planning of residential and public buildings as per recommendation of CBRI, Roorkee

Unit III :

Introduction to working drawing to scale and submission drawing as per I.S. 962, from the given sketch

Design and general specifications for different components of the building including terraced and pitched roofs. Developing submission drawings to scale with location plan, site plan and block plan. Developing submission drawings for single storey residential building (frame structures) with location plan, site plan and block plan.

Procedure for sanctioning the submission drawing. Study & terminology: FSI, TDR, Property card, Release letter, Power of attorney, Sale deed, Auto – DCR Software

Unit IV :

Graph paper drawing (line plans) based on various requirements for Residential, Public, Educational, Industrial Buildings and Interior aspects as well.

Unit V :

Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja

Text Books :

1. Building Drawing by Shah, Kale &Patki, TMH publication, Fourth Edition.
2. Building Planning & Drawing by Dr. N. KumaraSwamy, A. Kameswara Rao, 7th edition, Charotar Publishing House.
3. Civil Engineering Drawing by Malik and Meo, New Asian Publishers, Fifth Edn.

Reference books :

1. A course in Civil Engineering Drawing, Sikka V.B, S.K. Kataria& Sons Fifth Edition publication.
2. IS: 962-1989 (Code of practice for architectural and building drawing.
3. IS: 1256-1958 (IS Code of building byelaws), Indian Standard.
4. National Building Code of India 2005

V Semester B.E. (Civil Engineering)

Course code : CEP 305 | **Course : Building Design and Drawing**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week | **Total credit : 2**

Course Outcomes :

1. The students will be able to identify the basic principles of building.
2. The students will be able to know basic principles of free hand descriptive sketching to creative a realistic sketch of an object.
3. The students will able to prepare working and submission drawing of a building.
4. The students will able to construct a two point perspective of given two dimensional orthographic view of object.
5. The students will be able to plan residential and public building.

List of Practicals / Assignments :

1. Computer aided and free hand self-explanatory dimensioned sketches of various building elements.
2. Development of plans for residential building
3. Developing submission drawings for single storey residential building flat roof frame structure with access to terrace with location plan, site plan and block plan.
4. Developing submission drawings for double storey residential building load bearing structure with pitch roof to scale with location plan, site plan and block plan.
5. Graph paper design (line plans) based on various requirements for Hospital / Hostel buildings.
6. Graph paper design (line plans) based on various requirements for shopping complex / primary school building.
7. A. Developing working drawing for single storey residential building of flat roof frame structure.

   B. Development of single line plans for residential building.

   C. Two point perspective of various three dimensional blocks
8. Two point perspective of the single storied Residential building neglecting small building elements. (Pitched roof)
9. Two point perspective of the single storied Residential building neglecting small building elements.

   (Flat terraced roof)

V Semester B.E. (Civil Engineering)

Course code: CET 306 **Course: Hydrology and Water Resources**

L: 4Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 9**

Course Outcomes :

The students would be able to,

1. Understand and demonstrate the importance of water resource management and various hydrological parameters and also establish the parametric correlation between the hydrological parameters.
2. Measure hydrological parameters and analyze by applying various theories and equations.
3. Apply various mathematical techniques and equations in hydrological data analysis for determination of design discharge/flood of water resource project.
4. Describe importance of groundwater and recharging techniques to evaluate the yield of various sources of groundwater.

Unit I :

Introduction to Hydrology : definition, importance and its applications in civil engineering. Hydrological cycle, water budget equation, data required for hydrological study & its sources.

Precipitation: Definition, types of precipitation, various forms of precipitation, factors affecting precipitation, measurement of precipitation by non recording and recording type of rain gauges, mass curve, selection of site for rain gauges, density and adequacy of rain gauge stations, optimum number of rain gauges, determination of missing rainfall data, methods of estimation of mean rainfall, test for consistency of rainfall record, mass curve of rainfall, Hyetograph, Rainfall data of India.

Unit II :

Initial losses: Interception and depression storage.

Infiltration: definition, mechanism, factors affecting infiltration, measurement of infiltration, infiltration capacity, infiltration indices and its application.

Evaporation: definition, mechanism, factors affecting evaporation, estimation of evaporation.

Evapotranspiration: Definition, factors affecting Evapotranspiration, measurement, use of Blaney-Criddle and Thornthwaite formula.

Unit III :

Runoff: Source and its components, factors affecting the runoff, basin parameters, estimation methods, classification of streams, measurement of discharge of streams by area-slope and area-velocity method, stage discharge relationship, yield of the river. Flow mass curve, determination of reservoir storage volume.

Hydrographs: Definition, types, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph, superposition method , S-curve method ,Instantaneous unit Hydrograph, use & limitations of unit hydrograph, synthetic unit hydrograph, factors affecting flood hydrograph.

Unit IV :

Statistical Methods: statistics in hydrologic analysis, probability and probability distributions, Frequency of point rainfall, analysis of time series, Gumbel's method, Depth-Area-Duration (DAD) curve, Intensity-Duration-Frequency (IDF) curve, Depth-Duration-Frequency (DDF) curve

Floods: causes and effects, factors affecting peak floods and estimation of peak floods, estimation of design floods and its types. Indian Standard guidelines for design of floods (IS: 11223-1985)

Risk reliability, safety factor and safety margin for flood, introduction to flood routing, flood forecasting and flood control.

Unit V :

Ground water: Introduction, occurrence and zones of ground water, aquifer, aquiclude, aquitard and aquifuge. Confined and unconfined aquifer, aquifer parameters, Darcy's law, steady flow into a well, specific yield of open well.

Unit VI :

Groundwater recharge: Concept of recharge, selection of recharge sites, recharging methods, recharge through rain water harvesting and storm water harvesting.

Water Resources: Importance of water resources engineering, Availability of water on Earth, Water resources of India, River system of India, Inter basin water transfer, Inter-state river dispute, Necessity of conservation of water in India, Water resource planning through watershed management, Multipurpose water resource project, National water Policy and its guidelines.

Text Books :

1. Hydrology and Water Resource Engineering by P. Jaya Rami Reddy (University Science Press)
2. Hydrology and Water Resource Engineering by Subramanya (Tata Mc Graw Hill publication)

Reference Books :

1. Hydrology and Water Resource Engineering by S. K. Garg (Khanna publication)
2. Water power engineering by B.C. Punmia (Laxmi Publication)

V Semester B.E. (Civil Engineering)

Course code: CEP 307 **Course: Technical Writing**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 0**

Course Outcome:

On the completion of course, the students will able to:

1. Interpret the technical information in various technical documents
2. Develop proficiency in written communication
3. Effectively represent themselves professionally
4. Learn various techniques used on software to reduce laborious work

Minimum 10 of following Assignments

1. Introduction to technical writing, Definition, Technical Writing vs. Essays, Need and role of charts and diagrams in technical writing
2. English Grammar for effective writing and use of punctuations
3. Letters (Business Letter, Resume Cover Letter, Thank-You Letter after an Interview, Follow-up Letter after an Initial Contact, Letter of enquiry, etc.); composition and examples
4. E-mail and its effective utilization
5. Curriculum Vitae v/s Resume and preparation of the same
6. Importance and Effective utilization of charts, figures, equations, diagrams, etc.
7. Other technical writing documents like Memos, Brochures/Newsletters, Fliers, PowerPoint Presentations; importance and application
8. Technical Research paper writing (interpretation, significance, lay out, structure)
9. Thesis writing (interpretation, significance, lay out, structure)
10. Technical Reports (Laboratory Reports, Design Reports, Site Visit Reports, Progress Reports)
11. Types of communication; one to one-telephonic interview; one to many-speech; many to one- PI; many to many-GD
12. Using Templates in Microsoft Word

SIXTH SEMESTER

VI Semester B.E. (Civil Engineering)

Course code: CET 308 **Course : Estimating and Costing**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

The students should be able to,

1. Read the drawings, understand the details, identify the appropriate items and calculate the quantity of items involved in civil Engineering work including earthwork of road / canal and reinforcement of RCC members by applying the basic principles of computation.
2. Prepare approximate and detailed estimate of load bearing & framed structure and various civil engineering works. Evaluate the financial aspect of project.
3. Draft the specifications of various items involved in civil engineering works considering the object, type and principles of specification. Analyze the unit rate of item referring the specification of item and local or regional current market rates of materials and labors.
4. Prepare contract documents, float tender and select proper agency for execution of work according to types of contract. Supervise the work, prepare bills and maintain the accounts of works. Collect logical information and evaluate the present fair value of property for various purpose of valuation& Fixation of standard rent.

Unit I :

Definition of estimating and costing, Purpose of estimate, Mode and Unit of measurement of various items as per IS1200 , Work charge establishment, Contingencies, PWD as construction agency, Technical sanction, Administrative approval, Price escalation, ,Current schedule of rates

Types of estimate, Objective, use and methods of approximate estimate,. Estimate of earthwork of road & canal, Mass haul curve and its importance.

Detailed estimate of reinforcement in RCC members, bar bending Schedule

Unit II :

Methods of detailed estimate; detailed estimate of building for Load bearing structure and RCC framed structure

Unit III :

Methods of carrying out works, contract documents, essentials of contract, major conditions of contract & clauses, Types of contract and its suitability, Earnest money and Security deposit.

Tender notice, Types of tender, Acceptance and rejection of tender, Tender documents, Unbalanced tender, Pre qualification & Post qualification of contractor, Drafting of short tender notice, Liquidated damage, Arbitration.

Unit IV :

Specifications:- Definition, Objectives, Principles of writing specification, Sources of information, Types of specifications, Developing and drafting of details specifications of important items of buildings and road works.

Rate Analysis: Definition, Purpose, factors affecting, Task works per day, Rate analysis of important items of work. Comparison of analyzed rates with CSR rates

Unit V :

Valuation: Purpose, Factor affecting, Cost, price & value, Definition of various values used, Freehold & lease hold property, Methods of valuation of property.

Outgoing, gross income, net income, sinking fund, rent fixation, obsolescence, depreciation and its methods, capitalized value, year purchase

Cost accounting: MAS account, issue rates and store account. Measurement book

NOTE : There is no internal choice for questions based on Unit I and Unit II. These questions are set for 15 marks each. Remaining three questions set on Units III, IV and V with internal choice for 10 marks each. Duration of question paper is 4 hours.

Text Books :

1. Estimating, costing, specification and valuations in civil engineering by M. Chakraborti, 2010 edition.UBS publication Calcutta.

Reference Books :

1. Estimating and costing by B. N. Dutta, Publisher S. Dutta & company Lucknow, Feb 1999 edition. UBS publisher distributors Ltd, 5, Ansari road, New Delhi.
2. Estimating and costing by S. P. Chandola & V. N. Vazirani, 2010 Edition, khanna Publishers, 2-B, Nath market, Naisarak, Delhi.
3. Estimating Costing and valuation by S.C.Rangwala, 2011 edition, Charotar publishing house
4. Estimating costing and accounts (civil) by D.D.Kohli,10th edition, S Chand and company
5. Valuation of Real Properties by Roshan Namavati

VI Semester B.E. (Civil Engineering)

Course code: CEP 308 | **Course: Estimating and Costing**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week | **Total credit: 2**

Course Outcomes :

The students should be able to,

1. Identify the appropriate items; calculate the quantity of items involved in proposed civil engineering work by referring the requirements and detailed drawings.
2. Draft the specifications of various items by considering the object, type and principles of specification. Analyze the unit rate of items by referring the specification and regional current market rates involved in civil engineering work.
3. Prepare the approximate and detailed estimate of load bearing and framed structures, earthwork of road and several civil engineering works and evaluate the financial aspects of project.
4. Draft tender notice for execution of proposed work. Determine depreciation, book value, capitalized value and present fair value of property to evaluate the valuation of property for various purposes and fixation of rent.

List of Practicals :

Minimum 8 of the following:

1. Units and mode of measurements as per IS 1200 of various items of building and road works with current local market rates of constructional materials.
2. Preliminary estimate of building using plinth area method.
3. Detailed estimate of two room load bearing structure using long wall - short wall method
4. Detailed estimate of residential/ public building with RCC framed structure using long wall - short wall method and check by center line method.
5. Detailed calculation of reinforcing steel with bar bending schedule for important RCC member of civil engineering structure.
6. Detailed estimate of earthwork of hill road for 1 km length
7. Draft a detailed specification for 5 major items of works.
8. Analyze the unit rates for 5 major items of works.
9. Fixation of standard rent of building / property from the given data.
10. Determination of annual depreciation, total depreciation and book value of property
11. Determination of Capitalized value of a property.
12. Draft a short tender notice for proposed work.

VI Semester B.E. (Civil Engineering)

Course code: CET 309 **Course: RCC Structures**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

On completion of the course, the students:

1. Will be able to understand the basic concepts of reinforced concrete analysis and design.
2. Will be able to understand the behavior and various modes of failure of reinforced concrete members.
3. Will be able to analyze and design various reinforced concrete members viz. beam, slab, column, and footings by limit state Design method as per I.S.456-2000.
4. Will be able to understand, analyze and design simple prestressed concrete members.

Unit I :

Introduction to Limit State Design: concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of serviceability and limit state of collapse. Other limit states. Review of IS - 456-2000.

Limit State Of Collapse In Flexure: Analysis &design of singly reinforced rectangular section. Balanced failure mode and primary compression failure mode

Unit II :

Limit state of collapse in flexure; analysis of tee -beam section Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves.

Unit III :

Limit state of collapse in shear & bond: design of beam for shear, shear span , post cracking resistance , shear mechanism approach, shear failure modes and collapse load, interaction of shear , flexure and axial force.

Unit IV :

Design of simply supported, single span one way slab, cantilever slabs and continuous slab/ beam with IS Coefficients.

Design of rectangular pad / sloped footing for axial load

Design of Dog- legged and Open Well Staircases.

Unit V :

Prestressed Concrete: Introduction to IS-1343, Properties of high grade materials, concepts of prestressed concrete, method of prestressing, losses in prestressing. Various methods of prestressing particular reference to Freyssinet, Mangnel Blaton and Gifford Udall systems

Unit VI :

Ultimate Load Carrying Capacity of Prestressed Concrete Section

Analysis of rectangular, L and I section.

Design of prestressed concrete slab and rectangular beam

Text Books :

1. Reinforced concrete design, S.N. Sinha, Tata McGraw-Hill publications
2. Prestressed concrete , N KrishnaRaju, Tata McGraw-Hill publications

Reference Books :

1. Fundamentals of RC Design, M. L. Gambhir , PHI Learning Pvt. Ltd.
2. Limit State Design of Reinforced concrete, P. C. Varghese, PHI Learning Pvt. Ltd.
3. RCC Design , Menon & Pillai, Tata McGraw-Hill publications
4. Reinforced Concrete: Limit State Design, Ashok K. Jain, Nem Chand Publishers.
5. Practical Design of Reinforced Concrete Structures,Ghosh Karuna Moy , PHI Learning Pvt. Ltd.
6. Limit State Theory and Design of Reinforced Concrete, Karve S.R. and Shah V.L, Structures Publications, Pune. 2007.

VI Semester B.E. (Civil Engineering)

Course code: CEP 309 **Course: RCC Structures**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

On completion of the course, the students:

1. Will be able to understand the basic concepts of reinforced concrete analysis and design.
2. Will be able to understand the behavior and various modes of failure of reinforced concrete members.
3. Will be able to analyze and design various reinforced concrete members, using softwares and excel sheets.
4. Will be able to understand and analyze the effect of various support conditions on design of structures.

List of Practicals :

Practical shall consist of minimum 4 design assignments with detailed drawing on A-2 size sheets and detailed calculations in journal.

1. Single span prestressed concrete rectangular beam, slab.
2. One- way slab, continuous slab.
3. Rectangular pad / sloped footing.
4. Dog- legged and Open Well Staircases

One field visit and its report in the journal

VI Semester B.E. (Civil Engineering)

Course code : CET 310 **Course : Geotechnical Engineering - II**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

After completion of the course the students will be able to:

1. Plan the Geotechnical exploration program for major civil engineering structure.
2. Analyze the stability of slopes and solve the field problems.
3. Predict the earth pressure over the earth resisting structures.
4. Understand various geotechnical designs and select type of foundations.
5. Evaluate the various techniques of ground improvement and apply them on field.

Unit I :

GEOTECHNICAL EXPLORATION

Principle method of subsurface exploration geophysical methods, open pits and shafts, types of boring, number location and depth of boring for different structures, types of soil samples and samplers. Collection & shipments of samples, plotting of bore log and sampling record. Standard penetration test, corrections for field N- values &correlations for obtained design soil parameters.

Unit II :

LATERAL EARTH PRESSURE

Earth pressure at rest, active and passive pressure, general & local states of plastic equilibrium in soil.Rankine's and Coulomb's theories of earth pressure.Effects of surcharge, submergence.Rebhann's criteria for active earth pressure, Graphical construction by Poncelet and Culman for simple cases of wall- soil system for active pressure condition. Concept of reinforced earth retaining wall

Unit III :

STABILITY OF SLOPES

Causes and types of slope failure, stability analysis of infinite slopes and finite slopes, center of critical slip circle, slices method and friction circle. Slopes with pore pressure consideration. Taylor's stability numbers & stability charts, method of improving stability of slopes, types, selection and design of graded filter, soil nailing.

Unit IV :

SHALLOW FOUNDATION

Different types of shallow foundation and modes of failure. Bearing capacity of soil By Terzaghi's theory, Design criteria and codal provision, Effect of water table on bearing capacity, correction factor for shape and depth of footing, Bearing capacity estimation on sand and clays from N-value, factor affecting bearing capacity

Settlement of shallow foundation: elastic and consolidation settlement, differential settlement, control of excessive settlement. Proportioning the footing for equal settlement, Plate load test: Procedure, interpretation for bearing capacity and settlement prediction, limitations

Unit V :

PILE FOUNDATION

Classification of piles, constructional features of cast- in - situ & pre-cast concrete piles, Pile driving methods, Load transfer mechanism of axially loaded piles. Pile capacity by static formula & dynamic formulae, Bearing capacity of soil using Terzaghis, Meherhof's and Vesics theory for cohesive and cohesion less soil. Pile load test and interpretation of data, group action in piles, spacing of piles, negative skin friction and its effect on pile capacity, general feature of under reamed piles. Settlement of pile group

Unit VI :

GROUND IMPROVEMENT

Methods of soil stabilization, use of admixtures (lime, cement, fly ash), mechanical stabilization, Blending of soils, P.I. Concept, Basic concepts of reinforced earth use of geosynthetic materials salient features, function and application of various geosynthetic materials, Advanced techniques using geosynthetic materials such as geofoams, geocells, geotextile application. Sand drain installation, pre- loading. Stone column vibrofloatation techniques

Text Books :

1. Basic and Applied soil Mechanics by Gopal Ranjan&A.S.Rao, New edge international Ltd.2004
2. Geotechnical Engineering by Purushothama Raj, Tata McGraw Hill publishing Co. Ltd. 1995
3. Soil Mechanics in Theory and Practice by Alam Singh, Asia publisher and distributor, 1975 & later.

Reference Books :

1. Ground Improvement: Purushothama Raj; Tata McGraw Hill Publishing Co.

VI Semester B.E. (Civil Engineering)

Course code: CET 311 | **Course: Fluid Mechanics - II**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit: 7**

Course Outcomes :

The students would be able to,

1. State and describe the basic concept used in different types of incompressible fluid flow including the working principles of fluid machinery.
2. Understand the effect of various parameters involved in the fluid flow; analyze fluid flow and the problems associated with it under pressure and gravity flow.
3. Design various components of fluid flow and comparison of possible solutions.
4. Interpret the data / information and identify the appropriate concept and apply the same using basic principles for solving incompressible fluid flow problems.

Unit I :

Laminar Flow in Circular Pipes: Laminar flow in circular pipes and parallel plates; kinetic energy correction factor and momentum correction factor. Velocity and shear stress distribution; Hagen-Poiseuille equation, concept of drag & lift.

Boundary Layer Theory: Boundary layer along a long thin plate and its characteristics; laminar boundary layer; turbulent boundary layer; Laminar sub-layer; boundary layer thickness; displacement thickness; momentum thickness; energy thickness; total drag on flat plate due to laminar and turbulent boundary layer; forces on immersed bodies, drag and lift, Magnus effect;

Unit II :

Flow through Pipes:

Hydraulically smooth and rough pipe; frictional resistance to flow; Darcy-Weisbach & Hazen-William equation, Hydraulic gradient line and Energy gradient line. Pipes in series and parallel, branched pipe and looped networks, Analysis of looped networks using Hardy-Cross method. Water hammer pressure, three reservoir problem; flow through siphon; hydraulic transmission of power through pipe.

Unit III :

Flow through Open Channel:

General: Introduction to open channel flow; Types of channels, geometrical properties, types of flow in open channel, Chezy's equation; Manning's equation; determination of discharge; normal depth; most economical channel section.

Uniform Flow: Basics and computations.

Unit IV :

Critical Flow : Basics and computations; Applications of specific energy concept, gradual transition of channels, humps, width restrictions.

UNIT V :

Gradually Varied Flow (GVF): Introduction to GVF; Equation of gradually varied flow; analysis of GVF: Classification and characteristics of surface profiles; Computations of GVF using direct step method.

Rapidly Varied Flow (RVF): Basics, classification and analysis of hydraulic jump.

UNIT VI :

Fluid Machinery

Turbines –Basics components, heads, efficiencies, classification; reaction turbine (Francis); impulse turbine (Pelton wheel); specific speed; suitability; runaway speed; draft tube; unit quantities.

Centrifugal Pump: Basics, operating characteristics, pump head curve, system head curve, pumps in series & parallel, common problems and remedies; heads and efficiencies; specific speed; multistage pump for high head and large discharge; model testing of pump.

Text Books :

1. Fluid Mechanics and Hydraulic Machines by R.K. Bansal; Laxmi Publication (P) Ltd, New Delhi.
2. Hydraulics and fluid mechanics by Dr. P. N. Modi and S. M. Seth, 8th edition, Standard book house.

Reference Books :

1. Flow through open channel by K. Subramanya
2. Fluid Mechanics & Hydraulic Machines by S. C. Gupta, Darling Kindersley (I) pvt. Ltd. Pearson lieensee, Nodia, UP.
3. Fluid Mechanics – Fundamentals and applications by Yunus cengel, Jhon M Cimbala, Tata
4. McGraw Hill Publishing Company ltd New Delhi, 7th reprint 2009.
5. Flow through open channel by K. Subramanya
6. Fluid Mechanics through problems by Garde
7. Flow through open channel by K. G. Rangaraju.
8. Fluid Mechanics by Streeter and Wylie.
9. Open Channel Hydraulics by V. T. Chow.

VI Semester B.E. (Civil Engineering)

Course code: CEP 311 | **Course: Fluid Mechanics - II**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week | **Total credit: 2**

Course Outcomes :

The students would be able to,

1. Describe the process of experimentation. Handle and operate the equipments according to its working principle.
2. Determine important parameters, coefficients of equipments and interpret the experimental observations.
3. Analyze and compare the experimental and theoretical / analytical observations.
4. Plan and conduct the experiments in accordance with the objectives.

List of Practicals :

Minimum 8 of the following:

1. Determination of Manning's constant for open channel.
2. Determination of Chezy's constant for open channel
3. Developing specific energy diagram for a rectangular channel.
4. Study of GVF profiles.
5. Determination of efficiency of Centrifugal Pump.
6. Determination of efficiency of Pelton wheel
7. Determination of efficiency of Francis Turbine.
8. Determination of spillway constant.
9. Analysis of water distribution system using Hardy Cross Delta Q Method.
10. Any other experiments employing self learning and other tools.

VI Semester B.E. (Civil Engineering)

Course code: CEP 312 **Course: Computer Application in Civil Engineering**

L: 0Hrs, T: 0Hrs, P: 3 Hrs per week **Total credit: 3**

Course Outcomes:

1. The student will be able to analyze, identify and define computing requirement for engineering problems.
2. The student will be able to develop and execute computer program for solving mathematical and engineering problems.
3. The student will be able to deal with various types of solution errors occurred during cyclic computations.
4. The student will be able to develop tool for solving various engineering problems
5. The student will be able to work as an effective team member or team leader to accomplish common goal.
6. The students will be able to debug the program for common errors.

Unit I :

Operators, Control statements, looping structures, arrays, functions, fundamentals and applications of various numerical methods

Unit II :

Interpolation & Extrapolation techniques, Interactive Computer Program Development

Unit III :

Numerical Integration techniques, Interactive Computer Program Development

Unit IV :

Linear algebraic equation solution techniques, Interactive Computer Program Development

Unit V :

Initial & two point boundary value problems, Interactive Computer program development.

Unit VI :

Introduction to MS Excel, application of MS Excel to engineering problems

VI Semester B.E. (Civil Engineering)

Course code: CEP 313 **Course: Site Visits**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

Students will be able to

1. Understand field working atmosphere.
2. Understand materials, techniques, execution process.
3. Understand the working of latest equipments.

Students should be taken for visit to various Civil Engineering construction sites such as R.C.C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, watertanks, Roadworks, Railways, Water supply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, etc.

Minimum Five visits are expected. Students should submit a detailed report of the visit and evaluation will be based on presentation and viva - voce.

The Detailed Report should mainly consist of the following :

1. Name of Construction Site with address
2. Nature of construction work and various structural components
3. Nature of ownership, executing and supervising authority
4. Architect and Structural Engineer
5. Commencement of the work and tentative completion
6. Present Status of work
7. Estimated cost of the work
8. Mode of availability of finance
9. Various types of manpower for the work
10. Various safety measures and amenities provided to manpower
11. Various construction equipments for the work
12. Various materials used for the work
13. CPM I PERT of the project.
14. Type of inventory control
15. Resource planning implemented
16. Social benefits and implication

17. Safety measures during and posts construction
18. Post Construction Maintenance provisions
19. Effect on environmental aspect and sustainable development
20. Various of scaffolding, Formwork, lifting devices
21. Site of precast units for the work and its mode of transportation
22. Use of local available material like fly-ash, slag, silica-fumes, etc.
23. Clauses for delay / faulty construction
24. Clause for Arbitration

Discussion - Format and public speaking practice

Text Books :

1. Alan maley and Sandra Moulding, Learning to listen-Task for developing listening skill, Cambridge University Press, 1981.
2. Deborah C. Andrews, Margaret D. Blickle, Technical writing: Principle and forms Macmillan 1978.
3. Eric H. Glendinning and Beverly Holmstron, Study reading - a course in reading for academic purpose, Cambridge University Press 1992.
4. John Kirkman, Good style - Writing for Science and Technology, E and FN spon, an imprint of chapman and Hall 1992.

Reference Books :

1. List hamplyoms, Benheasley, Study writing, Cambridge University Press, 1987.
2. Louis Trimple English for Science and technology - A discourse approach, Cambridge University Press 1985.
3. Patric Hanks, Grim Corbett, Business listening task, Cambridge University Press 1986.
4. Sharon Bower, Painless/speaking, Thorsons 1990.
5. Stewart Zimmer and Camp, College English and communication, MaGraw Hill, 1987.

VI Semester B.E. (Civil Engineering)

Course code: CET 314-1 **Course: Open Elective - Environmental Pollution**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

The students would be able to,

1. Explain various causes of environmental pollution and necessity of their control.
2. Demonstrate the basic knowledge of air pollution and its control methodology.
3. Understand the basics of solid waste management.
4. Describe the necessity of wastewater treatment with the basic knowledge of treatment processes and disposal methodology.

Unit I :

Introduction to air pollution: definition of air pollutants, atmosphere and its zone, composition of various gases in clean atmosphere, air pollution episodes, classification of air pollutants with their sources, effects of air pollutants on man, animals, plants and materials

Lapse rates & atmospheric stability, meteorological parameters affecting dispersion of air pollutants, plume behavior, wind rose, estimation of stack height, greenhouse effect, atmospheric ozone depletion.

Unit II :

Ambient air sampling, stack sampling, principles of collection of particulate and gaseous pollutants.

Air pollution control: control of air pollutants by process change and by using various equipments.

Vehicular pollution: pollutions due to diesel and petrol engines and its control

Noise pollution: Sources, ill effects, control measures.

Unit III :

Introduction to solid waste management: Classification, sources, components, quantity and per capita contribution of solid waste. Physical and chemical characteristics, sampling and analysis of solid waste, Legislation and bylaws in SWM

Collection and transportation of solid waste: methods of collection, equipments used for collection and transportation of solid waste. Transfer stations and its economic use. Transportation routes for refuge vehicle.

Unit IV :

Solid waste processing: Various processing methods and choice of methods.

Solid waste disposal methods: composting: Principles, methods of composting, factors affecting composting. Sanitary land filling: site requirement & various methods of sanitary land filling. Incineration: principles, types, merits and demerits.

Introduction to E-waste management: Sources of E-waste, its characteristics, its effects and its disposal methodology.

Unit V :

General idea about water quality standards and its treatment, types of water demand, population forecasting, sources of water, characteristics of water and its effects. Various water borne diseases and its preventive measures, classification of waste water, determination of quantity of sanitary waste water and storm water, 3-R (Reduce - Recycle - Reuse) concept, Legislation and by laws, characteristics of waster water, necessity of waste water treatment, disposal of waste water and disposal standard.

Unit VI :

Wastewater treatment & disposal: Conventional wastewater treatment plant and function, significance and working of various units of conventional wastewater treatment plant. Significance and importance of Industrial wastewater treatment, various secondary treatment units used in industrial wastewater treatment. Significance, working and design of septic tank.

Text Books :

1. Environmental Engineering, Volume I & II by B.C. Punmia (Laxmi Publishers)
2. Environmental Engineering, Volume I & II by S.K.Garg (Khanna Publishers)

Reference Books :

1. Air pollution by M. N. Rao and H. V. N. Rao, (Tata McGraw Hill publications)
2. Environmental Pollution Control Engineering by C. S. Rao, (Wiley Estern Ltd.)
3. Solid waste management in developing countries by A. D. Bhide and B. B. Sundersan (INSDOC, New Delhi)
4. Water supply & Sanitary Engineering by G. S. Birdie (Dhanpat Rai Publication)

VI Semester B.E. (Civil Engineering)

Course code: CET 314-2 | **Course : Open Elective - Green Building and Vastu concepts**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit : 7**

Course Outcomes :

1. Students should be able to describe the importance and necessity of green building.
2. Students should be able to assess a building on the norms available for green building.
3. Students should be able to suggest materials and technologies to improve energy efficiency of building.
4. Students should be able to design and assess building with norms of vastu-shastra.

Unit I :

Introduction of green building, Concept of green building, History of green building, Need of green building in present scenario, Importance of green building Merits and demerits, Classification of green building, Assessment methods Global assessment and certification, Local assessment, LEED India GRIHA (Green Rating for Integrated Habitat Assessment)

Unit II :

Principles and elements of design of green building;

1. Sustainability: concept and reality
2. Climate responsive process of design: Climatic zones, design sequence, shelter or form, land form, vegetation, water bodies, street widths, open spaces, ground character, plan form, orientation, roof form
3. Shading devices and their effect

Unit III :

1. Thermal comfort inside the building: Factors affecting, indices, cooling and heating requirement, Heat transmission through building sections, thermal performance of building sections, simple calculation for U value and insulation thickness
2. Day lighting
3. Ventilation

Unit IV :

Water conservation: 3 R's for water conservation, rain water harvesting, low flow fixtures, grey water recycling

Material conservation: concept of embodied energy, low energy materials, sustainable materials, alternative materials Concept of carbon emission and its reduction.

Unit V :

Bureau of energy efficiency: Functions, policies, guidelines, Energy Conservation Building Code, Study of existing green buildings Introduction to Energy efficiency softwares, carbon calculators

Unit VI :

Vastu concept: History, scientific approach, importance of shapes size and direction, vastu of a plot, elements of vastu for selecting a plot, vastu of a residence, vastu of existing building

Text Books :

1. Climate responsive architecture (A design hand book for energy efficient buildings), Arvind Krishnana, Simos Yannas, Nick Baker, S V Szokolay, McGraw hill Education, Seventh reprint, 2013
2. Renewable Energy and Environment -A Policy Analysis for India, H, Ravindranath, K Usha Rao,
   B Natarajan, P Monga, Tata McGraw Hill, 2000
3. Energy and the Environment, JM Fowler, McGraw Hill, New York, 2nd Edition, 1984

Reference Books :

Standards / Guidelines
1. Handbook on functional requirements of buildings (SP41), BIS, New Delhi, 1987
2. Energy Conservation building code (ECBC), Bureau of energy efficiency, 2011

VI Semester B.E. (Civil Engineering)

Course code: CET 314-3 **Course: Open Elective - Appropriate Technology**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

1. The students will be able to understand the technological needs of rural community.
2. To students can apply technical knowledge to develop appropriate technology based on regional needs.
3. The students can demonstrate technological development to increase productivity, safety and earnings.

MECHANICAL ENGINEERING SYLLABUS

Unit I :

Introduction : Background and history, Importance of Appropriate Technology, contribution of E. F. Schumacher. Terminology : appropriate technology and practitioners, appropriate technology and development, appropriate technology in developed countries.

Role of Science and Technology in Rural Development; Rural Technology and Poverty Eradication; Rural Business Hubs, Rural technologies for livelihood improvement

Unit II :

Advances in Rural Energy Resources :Definition of Energy, Types of alternative sources of energy, Solar energy- Collection, Storage and Uses, Wind energy- basic design, Working and maintenance of wind turbines, Hydropower, micro Pelton turbines and micro hydro electric power. Manually energized applications for multiple activities, Transportation: Appropriate industrial technology for low cost transport for rural areas, Agriculture: Selection and design of appropriate farm equipments to improve productivity.

Unit III :

Field base based studies in context with Vidarbha region.

1. Fly ash bricks 2. Orange Processing 3. Bamboo Technology
4. Cotton carding 5. Rice Processing 6.solar pumps,

CIVIL ENGINEERING SYLLABUS

Unit IV :

1. Concepts, Background and meaning of appropriate Technology in relation to civil engineering.
2. Movement of Appropriate Technologies in civil engg.
3. Application of Appropriate Technologies

Alternate energy sources: Bio-fuels/ Bio gas: Use of agricultural and domestic waste in making bio fuels like charcoal & in generating bio gas. Process and plant details, techno economics, smoke free cooking.

Unit V :

Low cost Houses: Use of locally available construction materials, use of bamboo, fly ash/lime bricks, hygienic toilets, Manufacturing of local cements using local materials.

Water and Sanitation: Rain Water Harvesting , Designing of Bunds, Appropriate Techniques for construction and design of Sanitation, Sewerage, Water Purification & Recycling - DEWATS

Unit VI :

Field base based studies in context with Vidarbha region.

1. Recycling of waste for Composting
2. Low cost water treatment plants
3. Low cost sewerage treatment plants
4. Low cost all weather roads 5. Low cost Bio gas plant.

Text Books :

1. S. B. Prabhath, (2012), "Technology and Rural India", Serials Publications

Reference Books :

1. Sundaram J.B, (1980), Rural Industrial Development, Vora & Co.
2. Barrett Hazeltine and Christopher Bull, Appropriate Technology: Tools Choices and Implications
3. Richard Heeks, Technology and Developing Countries: Practical Applications Theoretical Issues
4. John Pickford, The Worth of Water Technical Briefs on Health, Water and Sanitation, Intermediate Technology Publications, 1998
5. Stevenson, L and A. Lundstrom. Patterns and Trends in Entrepreneurship: SME Policy and Practice in Ten Economies, Orebro, Sweden: The Swedish Foundation for Small Business Research
6. Storey, D.J. Understanding the Small Business. London and New York: Routledge, 1994
7. Entrepreneurship, Small and Medium Enterprises and Public Policies, Hand Book of Entrepreneurship Research, New York: Springer, 2005

Journals :

1. Knopp, L. 'State of the Business Incubation', NBIA, Review, August 2007, 24(4)
2. Duff, A.. ' Best Practice in Business Incubator Management', AUSTEP Strategic Partnering Pty Ltd, 2004
3. Lichtenstein, G.A. 'The Significance of Relationship in Entrepreneurship in Two Business Incubator.' Ohio: NBIA Publication, 1992.

NGOs:

Use of Bamboo- Shri Sunil Deshpande: Appropriate Rural Technology Institute, Pune: Institute of Appropriate Technology, Bangladesh: Low cost Housing - Wardha

SEVENTH SEMESTER

VII Semester B.E. (Civil Engineering)

Course code: CET 401 | **Course: Advanced Concrete Structures**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit: 7**

Course Outcomes:

On completion of the course, the students:

1. Will demonstrate the ability to understand the behavior and modes of failure of reinforced concrete members such as statically indeterminate continuous beams, short and slender columns, biaxially bent columns, footings (single and combined), staircases and retaining walls etc.
2. Will demonstrate the ability to analyze and design reinforced concrete members such as statically indeterminate continuous beams, short and slender columns, biaxially bent columns, footings (single and combined), staircases and retaining walls etc.
3. Will demonstrate the ability to relate the knowledge and design skills taught in class to real world problems & implement the technique in designing.

Unit I :

Limit state of collapse in flexure: Analysis and design of doubly reinforced rectangular, T and L section

Limit state collapse in Torsion: Concept of interaction of torsion, shear and flexure, analysis and design of rectangular sections for torsion, shear and flexure.

Limit state of serviceability: Deflection calculations for beams and one way slabs.

Unit II :

Moment redistribution, analysis and design of fixed beams, propped cantilever, two span symmetric continuous beam.

Unit III :

Analysis and design of columns subjected to biaxial moments, design of long columns

Analysis and design of portal frames (single bay single storey), hinged or fixed at base, design of hinge and design of foundation.

Unit IV :

Design of isolated footings for uniaxial and biaxial bending for square, rectangular and circular section

Design of combined footing

- Rectangular footing
- Strap beam footing
- Trapezoidal footing
- Raft footing

Unit V :

Design of RCC two way slab with various end conditions using with IS code coefficient.

Design of RCC cantilever and counter fort retaining wall.

Reference Books :

1. Illustrated Design of RC Buildings by V. L. Shah and S. R. Karve, Standard Publisher
2. Reinforced concrete design by S. Sinha , Tata McGraw Hill Publications
3. Fundamentals of RC Design, M. L. Gambhir, PHI Learning Pvt. Ltd.
4. Limit State Design of Reinforced concrete, P. C. Varghese, PHI Learning Pvt. Ltd.
5. RCC Design, Menon & Pillai, Tata McGraw-Hill publications
6. Limit state Design of reinforced conc. (As per IS 456:2000), Dr. BC Punmia, A.K. Jain, Laxmi publications.
7. Reinforced Concrete: Limit State Design, Ashok K. Jain, Nem Chand Publishers.
8. Practical Design of Reinforced Concrete Structures, Ghosh Karuna Moy, PHI Learning Pvt. Ltd.
9. Limit State Theory and Design of Reinforced Concrete, Karve S.R. and Shah V.L, Structures Publications, Pune.2007

VII Semester B.E. (Civil Engineering)

Course code: CEP 401 — **Course: Advanced Concrete Structures**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week — **Total credit: 2**

Course Outcomes :

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

1. Apply basic requirements of I.S. code for loadings on structures and RCC design.
2. Analyze and design R.C. walls, slabs, combined footings and retaining walls.
3. Apply principles, procedure and code requirement to analysis and design of RCC structures through design project and work in groups in the solution of design problems.

List of Practicals :

Practical work shall consist of

Design assignments with detailed drawings on A-2 size sheet and detailed calculations in journals.

1. Two way slab with various end conditions
2. Cantilever/counterfort retaining wall
3. Combined footing
4. Portal frame

Development of excel sheet for development of interactive curve for rectangular column.

VII Semester B.E. (Civil Engineering)

Course code: CET 402 **Course: Irrigation Engineering**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

The students would be able to:

1. Identify, describe and explain the necessity and scope of irrigation engineering.
2. Understand the various types of irrigation schemes, its components and their functions.
3. Apply knowledge of basic science and engineering principles for analysis and design of various components of irrigation scheme.
4. Justify and describe the necessity of various repairs and maintenance work and its methodology for various components of irrigation scheme.

Unit I

GENERAL : Necessity and importance of Irrigation Engineering; Benefits & ill effects of Irrigation; Classification of Irrigation schemes; General principles of flow, lift, perennial, inundation Irrigation systems; Comparative study of sprinkler and drip Irrigation systems.

WATER REQUIREMENT OF CROPS : Suitability of soils for Irrigation, Standards of Irrigation water; PET-R method of crop water requirements; Depth and frequency of Irrigation; Command area classification, Relation between duty and delta; Factors affecting duty; Principal crops in India; Crop rotation; Methods of assessment of Irrigation water.

Unit II

RESERVOIR PLANNING : Selection of site for Reservoirs; Engineering surveys, Geological and Hydrological Investigations; Fixing of Reservoir levels; Different storage zones in reservoir; Determination of storage capacity by mass curve method; Reservoir sedimentation; Life estimation of reservoir by Brune's method;

Organization & Administration of Irrigation projects

DAMS: GENERAL: Classification of dams as per use, hydraulic design and materials; Factors governing selection of type of dams.

Unit III

GRAVITY DAM: Definition; forces acting on gravity dam; stability requirements; Theoretical & practical profile of gravity dam; Low & High dam; Galleries.

EARTHEN DAMS : Types of earthen dam; Description of component parts of earthen dams- seepage through body of earthen dam and drainage arrangements; Failure of earthen dams; Plotting of pheratic line for homogeneous earthen dams with horizontal filters; Stability checks.

Unit IV

SPILLWAYS: Types of spillway, General principle of design of ogee spillway; Spillway gates - vertical lift, radial, rolling and drum; Energy dissipation methods d/s spillways.

DIVERSION HEAD WORKS: Component parts of diversion headworks; Causes of failure of weirs on permeable foundation; Bligh's Creep theory; Dr. Khosla's theory for design of weirs on permeable foundations.

Unit V

CANALS: GENERAL : Types of canal; Alignments of canal; Cross section of Irrigation canals; Balancing depth; Schedule of area statistics; Losses in canals.

CANALS IN ALLUVIAL SOILS : Kennedy's silt theory - Design procedure, silt supporting capacity, drawbacks; Lacey's silt theory - Definition of initial, final and permanent regime channels, Lacey's Regime equation, channel design procedure, drawbacks; Garret's diagram and Lacey's diagram for channel design.

LINED CANALS: Design procedure, Types of lining, relative merits and demerits of canal lining, Economics of canal lining

Unit VI

CANAL STRUCTURES

CANAL REGULATION WORKS: Only theoretical aspects of location, objects, classification, components and schematic section of Head Regulator, Cross regulators, canal escapes, Canal falls and canal outlets.

CROSS DRAINAGE WORKS: Only theoretical aspects of location, objects, classification, components and schematic section of aqueducts, siphon aqueducts, super passage, canal siphon, inlets and level crossings.

WATER LOGGING AND LAND DRAINAGE: Causes, effects, preventive measures of water logging, Types of drains, Layout of tile drains system, flow of ground water to drains.

SOIL ERROSION: Causes, effects and control

Text Books:

1. Irrigation Engineering and Hydraulic Structures by Santosh Kumar Garg, Khanna Publishers.
2. Irrigation Engineering and water Power Engineering, B. C. Punmia, Laxmi Publications.

Reference Books:

1. Irrigation Engineering and Hydraulic Structures by K. R. Arora, Standard Publishers.
2. Irrigation Engineering and Hydraulic Structures by R. K. Sharma, S.Chand Publications.
3. Irrigation and Water Resources Engineering by G. L. Asawa, New Age International Publishers.
4. Irrigation Engineering by P. N. Modi, Standard Publishers.

VII Semester B.E. (Civil Engineering)

Course code: CEP 402 **Course: Irrigation Engineering**
L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

The students would be able to:

1. Know the design of various components of irrigation scheme.
2. Check stability of a given section of gravity and earthen dam.
3. Design lined and unlined canals.
4. Determine reservoir capacity and life of reservoir

List of Practicals:

1. Reservoir Planning - Capacity of reservoir.
2. Life of Reservoir.
3. Gravity Dam - Stability checks.
4. Earthen Dam - Phreatic Line, Stability checks.
5. Design of canals (Lined and Unlined).
6. Design of Lift Irrigation Scheme.

VII Semester B.E. (Civil Engineering)

Course code : CET 403 **Course: Contract, Accounts & Work Management**
L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

The students will be able to

1. Demonstrate entrepreneurship skills to start a business venture in Civil Engineering
2. Exhibit knowledge for formation of business organization and its registration with various government agencies
3. Demonstrate understanding in respect of business laws and different types of taxation which are applicable to civil engineering profession
4. Design and make financial analysis of civil engineering projects

UNIT I

Introduction to Accountancy: Double entry system, ledger and journal, cash book, Profit and Loss account, Balance sheet

UNIT II:

Depreciation - straight line, reducing balance, sinking fund. Inventory Management - Economic Order quantity, Fixation of Inventory levels, Investment appraisal - payback period method, NPV method and IRR method

UNIT III

Types of cost, Standard cost and budgeting, different types of budgets, advantages and problem Variance analysis - labour, material, overheads

UNIT IV

Labor laws, Safety laws, Types of Tenders and Conditions, General regulations related to town planning

UNIT V

VAT, Sales Tax, Work tax, Professional Tax, Turn over tax, Service tax, Income tax, Capital Gain Tax

UNIT VI:

Types of business organization- proprietorship, partnership, co- operative, private company, public company, Project financing - short, medium and long term.

Text Books

1. Accounting Principles; R N Anthony
2. Cost and Management accountancy: S P Jain
3. Financial Management: M Y Khan
4. Business Laws: P R Chadha
5. Taxman's student guide to company law: A K Mujumdar
6. Taxman's student guide to Financial Management: Ravi Kishore

VII Semester B.E. (Civil Engineering)

Course code : CET 404-1 **Course: Elective I - Advance Construction Material**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total Credit: 7**

Course Outcomes :

1. The students will be able to classify and select advance construction materials on the basis of their properties.
2. The students will be able to identify and suggest ceramic and polymeric materials for improvement in functional performance of building components.
3. The students will be able to demonstrate the use of industrial by-products and waste in new building materials.
4. The students will be able to explore use of new construction chemicals and repairing methods.

Unit I

Construction Materials : Classifications, selection criteria for construction materials.

Materials Engineering concept: Consideration of physical, Mechanical, thermal, and other Properties. nature of materials Laboratory measuring devices: Introduction of Dial gauge, LVDT, strain gauge, proving ring, load cellt

Unit II

1. Ceramic Materials : Mechanical, thermal and electrical properties Processing of ceramic, classification, refractories, glass, uses and application
2. Concrete : Special concretes, high performance concrete.
3. Light Weight blocks and bricks.

Unit III

Polymeric Materials : Polymerization, Plastic as engineering material, Thermoplastics, Thermosetting plastic, Properties, additives and compounding of polymers, methods of processing of polymers, uses and application

Unit IV

Composites : requirements, classification, microscopic composites, macroscopic composites, their applications

Thermal performance of materials and insulating materials

Acoustics and sound proofing methods and materials

Ferro-cement, Fibre reinforced concrete, special concretes, high performance concrete,

Unit V

Engineering wood products

Use of waste products and industrial by-products: Fly ash, micro-silica, GGBFS and other mineral products

Geo-textiles and geo-synthetics.

Unit VI

1. **Construction Chemicals :** Property modifiers, materials for repair and retrofitting.
2. New Construction materials e.g. Cladding, false ceiling and paneling etc. Plasticizer, Super plasticizers, Accelerators, air entraining agent, Sealant adhesive, grouting agent, curing compounds & bonding agents.

Reference Books :

1. Engineering materials: Polymers, Ceramics and composites, Bhargava A K, PHI Publications, Second edition, 2012
2. Materials for Civil and Construction engineers, Michael S Mamlouk, John P Zeniewski, Pearson Publications, Third edition, 2014
3. Engineering Materials, Rangawala S. C., Chortor Publications
4. Building Materials, S. K. Duggal, New Age International Publications, Fourth edition, 2012
5. Building Materials Technology Structural Performance & Environmental Impact, L. Reed Brantley, Ruth T. Brantley, McGraw Hill Inc Publications
6. Construction Materials by Peter domone and John Illstone Handbook of admixtures.
7. Consturction chemicals by R. Ram chandran, Handbook of admixtures.

VII Semester B.E. (Civil Engineering)

Course code: CET 404-2 **Course : Urban Transportation Planning**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course outcomes:

The students will be able to

1. Explain the characteristic of urban transportation, structure of urban transportation and classification of urban roads.
2. Describe the objectives of transportation planning, data collection for planning and environmental impact analysis.
3. Explain the process of travel demand forecasting & need for interation in different modes of transportation.
4. Describe the use of intelligent Transport System and need to accommodate non-motorized transports.

Unit I

Urbanization and Transportation :

Importance of urban area, Structure of urban area, urban design, use of road space, classification of urban roads.

Unit II

Urban Transportation Characteristics :

Factors influencing transportation needs, transportation demand, type of trips, mode of travel, urban transportation scene in India.

Road congestion, impact of transport on environment.

Unit III

Urban Transportation Planning Process :

Urban transportation planning objectives, urban transportation system, urban transporatation planning process, data collection, surveys for data collection, environmental impact analysis.

Unit IV

Travel Demand Forecasting :

Trip generation and attraction analysis, trip distribution models, model split analysis, route assignment analysis.

Unit V

Public Transporation :

Bus transport characteristics, bus route planning, performance indicator, types of rail transit, rail transit system development in Indian cities, Integrated Transport System, Modes of Integrated transport systems.

Unit VI

Innovations in Urban Transporation :

Need for innovative approaches, track guided bus, BRT, GIS, ITS, functional areas of ITS.

Non - motorized Urban Transporation :

Importance of pedestrian facilities, sidewalks, PUP & POB, bicycle facility planning, types of bicycle facilities, bicycle network planning, bicycle parking, cycle - rickshaws.

Text Books :

1. Traffic Engineering and Transport Planning : L R Kadiyali, Khanna Publishers.
2. Urban Transportation : D. J. Victor & S. Ponnuswamy, Tata McGraw - Hill

Reference Book :

1. Transport Planning and Traffic engineering : C A O' Flaherty, BUTTER WORTH-HEINEMANN
2. Urban Development and Sustainable Transport **P. Anbalagan**, Bookwell Publications
3. Urban Transporation Planning 2nd Edition by Michael Meyer (Author), Eric Miller (Author) McGraw - Hill.

VII Semester B.E. (Civil Engineering)

Course code: CET 404-3 **Course: Elective I - Advanced Hydraulics**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes:

The students would be able to,

1. Apply knowledge of kinetics and kinematics of Fluid mechanics to explain importance of Advanced Hydraulics in dealing with problems in water resources sector.
2. Describe and explain the application of specific energy and specific force concepts in open channel hydraulics.
3. Understand, identify and analyze GVF profiles in practical situations and determine length of the profiles.
4. Use appropriate water hammer theories and identify the causes of pipe failures due to water hammer phenomenon. Analyze and design the flow in Surge tank also suggests the ways and means to deal with the related problems.

Unit I

Computation of uniform flow, Computation of critical flow, Theory of gradually varied flow, Analysis of surface profile of gradually varied flow

Unit II

Computation of gradually varied flow, Hydraulic jump

Unit III

Unsteady flow in a pipe line for incompressible fluid, Rigid water column theory and computation of water hammer pressure

Unit IV

Water hammer pressures in pumping systems.

Elastic water column theory and computation of water hammer pressure; Allievi's Method characteristics

Unit V

Analysis and design of surge tank, computation of water hammer pressure in branched pipe system.

Water hammer pressure reduction and various devices used for protection from water hammer pressures.

Unit VI

Analysis of flow through surge tank system, Computation of maximum surge in a simple surge tank, Hydraulic stability in a simple surge tank system.

Text Books :

1. Theory and Application of fluid mechanics by K. Subramanya. Published by Tata McGraw Hill Publishing Company Limited, New Delhi.
2. Open Channels hydraulics by Ven Te Chow
3. Fluid mechanics by Streeter & Wylie

Reference Books :

1. Flow in open channels by K. Subramanya
2. Fluid Mechanics - Fundamentals and applications: Yunus cengel, John M Cimbala, Tata McGraw Hill Publishing Company, 7th reprint 2009.

VII Semester B.E. (Civil Engineering)

Course code: CET 404-4 **Course : Elective I - Advanced Geotechnical Engineering**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

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

1. Identify, formulate and solve geotechnical engineering problems.
2. Know the swelling and shrinkage characteristics of soil
3. Know improvising techniques, skills, and modern engineering tools necessary for understanding in geotechnical engineering practice.

Unit I

Expansive Soils: Mechanism of swelling recognition & identification of expansive soil. Free swell indices, ground heave, swelling pressure & swelling potential, factors affecting expansivity and swelling pressure of soil, properties and uses of bentonite slurry, introduction to CNS technique

Unit II

Analysis and design of foundations on expansive soils

Unit III

Seepage & Dewatering: Introduction to Seepage, Two dimensional flows, Laplace equation and its numerical solutions, flow net, unconfined flow, seepage in an anisotropic soil condition.

Purpose of dewatering, various methods, well point systems, their suitability, concept of electro osmosis

Unit IV

Consolidation: 1-D consolidation theory, application to consolidation due to sand drains, constructional features and design of sand drain installation, Introduction to NPVD and PPVD. Secondary consolidation phenomenon, estimation of secondary consolidation settlement, over consolidated soil, over consolidation ratio, Schmertmann's method for determination of Pre-consolidation pressure field consolidation curve

Unit V

Shear Strength: Concepts of effective stress in soil, Mohr's stress circles. Mohr Coulomb`s theory, Unconfined compression and Triaxial testing, Drainage conditions in field problems UU, CU, & CD test. Shear strength characteristic of cohesive and cohesionless soil.

Unit VI

Special Geotechnical Constructions: Ground (soil and rock) anchors, soil nailing, screw pile and secant pile walls.

Text Books :

1. Basic and Applied soil Mechanics: Gopal Ranjan & A.S. Rao, New Edge International Ltd., (2004)
2. Geotechnical Engineering-Principles & Practices: Coduto, D.P. Pearson Edn. Asia

Reference Books :

1. Fundamentals of Geotechnical Engineering: B.M. Das, Cengage Publishers
2. Seepage, drainage and flownet : Cendergren,
3. Ground Improvement Techniques: Dr. P. Purushothama Raj, University Science Press
4. Principles of Geotechnical Engineering , Soil Mechanics and Foundation Engineering: V.N.S. Murthy

VII Semester B.E. (Civil Engineering)

Course code: CET 404-5 **Course : Elective - 1 Environmental Management**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

1. Able to explain the fundamentals and identify the methodology and tools used for EM
2. Able to understand the basics of environmental impact assessment (EIA) as an environmental management tools and trace the evolution of EIA
3. Able to discuss the evolution of environmental policies and laws and implications of international policies and laws for India.

UNIT I

Global and Indian scenario National Environmental Policy, Environmental organizations for planning and implementation of sustainable development, Preventive and reactive strategies for environmental pollution control.

UNIT II

Environmental impact and risk assessment :, Nature of Impact - primary, secondary, tertiary, short-term long - term, local and regional, reversible & irreversible impacts.

EIA Methodologies : Ad hoc, check-lists, network, matrix etc. Environmental Management plan. MoEF questionnaire for environmental clearance.

UNIT III

Environmental Audit definition, concept of EA, types and benefits of environmental audit, scope & objectives, environmental statement, procedural aspects of conducting environmental audit, pre-audit phase, on-site audit phase & post-audit phase, economic benefits of environmental audit.

UNIT - IV

Environmental Legislations and its basic concepts, critical issues, civil liability, various enactment and their provisions - Water Act (1974, 1988), forest Conservation Act (1980), Air Act (1981, 1988), Water (Cess) Act 1977, Environmental Protection Act 1986, Role of State & Central boards of pollution control, local government social action groups, and environmental policies.

Text Books :

1. S. Mushraf, Legal Aspects of Environmental pollution and Its Management, C. B. S. publishers, Delhi 1932.
2. R. K. Jain, L. V. Urban G. S. Stacey, H. E. Balbach, Environmental Assessment McGraw-Hill, Inc. N. Y.
3. Rao, J. G. and Wooten, Environmental Impact Analysis, Hanfbook, 1980.
4. Center, L. W. Environmental Impact Assessments, - N.Y. McGraw - hill book Co. 1977.

Reference :

1. Rosencrannz, S. Divan, M. L. Noble, Environmental Law and Policy in India, Cases, Materials and Statutues, Tripathi Pvt. Ltd. Bombay.

VII Semester B.E. (Civil Engineering)

Course code: CET 404-6 **Course: Elective I - Advanced Steel Design**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

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

1. Recognize the design philosophy of steel structures and understand the concept of limit state design.
2. Understand the behavior of steel structures, in particular to the various forms of failure for members and connections under tension, compression, bending and combined actions.
3. Apply the principles, procedures and current codal requirements to the analysis and design of advanced steel structures like chimney, storage vessels, industrial shed, crane and gantry girders, bridges, etc.

Unit I

Design of connections (moment resistant / eccentric)

Unit II

Design of steel chimneys, Design of storage vessels

Unit III

Design of industrial sheds, crane / gantry Girders, Design of round tubular structures

Unit IV

Design of bridges - highway and railways, Foot Bridge

Text Books:

1. Duggal, S. K.; Limit State Design of Steel Structures; Tata McGraw Hill Education Private Limited; 2011
2. Englekirk, R.; Steel Structures Controlling Behaviour Through Design; John Wiley & Sons Inc.; 2003
3. Subramanian, N.; Design of Steel Structures; OXFORD University Press; 2008.

VII Semester B.E. (Civil Engineering)

Course code: CET 405 **Course: Structural Analysis- II**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

On completion of the course, the students will be:

1. Able to know the deflected shape of structures for understanding response due to various loads.
2. Able to analyze the beam and frames for vertical and horizontal loads and draw SFD and BMD.
3. Able to calculate forces in members of truss due to load by stiffness method.
4. Able to analyze the non-prismatic beam for understanding its behavior.

Unit I

Kani's method applied to symmetrical and unsymmetrical frames with sway (Upto one bay two storey)

Unit II

Approximate method structural analysis for multistoried frames with lateral loads (portal and cantilever method), Approximate methods for vertical loads i.e. Substitute method etc. (Max three bay three storeys)

Unit III

Column analogy Method, Application to beams, Calculations of stiffness factors and carryover factors for non-prismatic member, Analysis of non-prismatic fixed beams

Unit IV

Introduction to Flexibility Method of structural analysis, influence coefficients, Choice of base determinate structure and redundant forces, compatibility equations and solution of simple beam problems upto 3 degree of indeterminacy.

Unit V

Basic concept of Degree of Kinematic Indeterminacy, Direct stiffness method as applied to continuous beams and portal frames

Formulation of stiffness matrix for TRUSS/BAR element, Member load matrix and structure load matrix formulations. Formulation of transformation matrix assembly, Equilibrium equations, Solution to numerical problems to maximum 3 degree of freedom.

Unit VI

Formulation of stiffness matrix for BEAM element, Member load matrix and structure load matrix formulations. Equilibrium equations, Solution to numerical problems to maximum degree of freedom four

Formulation of stiffness matrix for FRAME element, Member load matrix and structure load matrix formulations. Formulation of transformation matrix assembly, Equilibrium equations, Solution to numerical problems to maximum 3 degree of freedom, Frames with inclined legs.

Text Books:

1. C.K. Wang, 'Intermediate Structural Analysis', Tata McGraw Hill Publishing Co.
2. S P Timoshenko, ' Theory of Elasticity' Tata McGraw Hill Publishing Co.
3. Matrix Analysis of Structural by Robert. E. Sennete Prentice Hall, Englenwoodelift, Newjersy.
4. Structural Analysis-Matrix Approach G.S. Pandit& S.P. Gupta,Tata McGraw Hill Publishing Co. Ltd.

Reference Books:

1. Matrix Analysis of Structures: Gere and Weaver, CBS Publication House.
2. Matrix Analysis of Structures: Meghre and Deshmukh, Charotar Publication House.
3. Matrix methods of Structural Ananlysis : P.N.Godbole,R.S.Sonparote, S. U. Dhote , PHI learning Pvt Ltd. publishers.

VII Semester B.E. (Civil Engineering)

Course code : CEP 405 — **Course: Structural Analysis- II (P)**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week — **Total credit : 2**

Course Outcomes :

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

1. Analyze and validate the results obtained from the software with the analytical solutions.
2. Analyze various structural elements such as beams, frames, truss etc. with the help of available commercial software packages.

Practicals :

Practical shall consist of any six experiments on beam, frame, and truss analysis using software (STAAD/SAP) as mentioned below, also they should consist a repot presenting the technical output generated from the used software:

1. Analysis of continuous beam using appropriate software.
2. Generate shear force and bending moment diagram for continuous beam having sinking support using appropriate software.
3. Analysis of overhang continuous beam using appropriate software.
4. Analysis of portal frame (Non-Sway) using appropriate software.
5. Analysis of portal frame (Sway) using appropriate software.
6. Generate shear force and bending moment diagram for inclined leg portal frame using appropriate software.
7. Analysis of simple truss for calculation of member forces and generate axial force diagram using appropriate software.
8. Analysis of simple truss (with sinking support) for calculation of member forces using appropriate software.
9. Analysis of simple truss (with inclined support) for calculation of member forces using appropriate software.

VII Semester B.E. (Civil Engineering)

Course code: CEP 406 | **Course: Project and Seminar**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week | **Total credit: 4**

Course Outcomes :

The students would be able to;

1. Acquired the knowledge about construction process and technical information about the execution and maintenance of civil engineering works.
2. Identify a project topic and to collect relevant data through literature survey.
3. Formulate methodology and identify equipment/software/materials requirement to execute the project work.
4. Demonstrate effective communication skills.

Syllabus:

a. Student will submit a report on summer training undertaken after VIth Semester examination and give a presentation.

b. This includes preparation of preliminaries for the project work to be under taken in 8th Semester.

   1. Finalizing the title of the project
   2. Literature Survey
   3. Collection of Data
   4. Scope of the project

Each group shall deliver seminar on the project work done during the semester.

EIGHTH SEMESTER

VIII Semester B.E. (Civil Engineering)

Course code : CET 407 | **Course : Transportation Engineering - II**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit : 7**

Course Outcome :

After the completion of the course in Transportation Engineering-II, the student should be able to

1. Define and describe various component parts of railway track.
2. Memorize and explain various technical terms used in railway stations.
3. Explain, Discriminate and design various geometric features of railway track.
4. Define and describe the construction and maintenance steps of railway track.
5. Memorize and explain various terminologies used in planning of airports and construction of tunnels.

Unit I :

Railway Engineering: Permanent way, gauges, coning of wheels and tilting of rails. Rail types, wear and failure, Sleepers, rail Fixtures and fastening, ballast cushion. Traction and Tractive resistance, hauling capacity and tractive effort of locomotives

Unit II :

Geometric design of railway track: Gradients, speed, super elevation, Cant deficiency, Negative super elevation, curves, length of transition curves, grade compensations, Points & crossings: Left and right hand turn out, design calculations for turnout & Crossover, railway track functions. Station and Yards: Types, functions facilities & equipment.

Unit III :

Railway track construction & Maintenance: Construction, inspection, modern techniques of maintenance, Push through Technique, Suburban Railway in Metro cities.

Unit IV :

Airport Engineering: Aircraft characteristics, Airport site Selection. Modern aircrafts.

Airport obstructions: Zoning Laws, imaginary surfaces, Approach and turning Zone, clear zone, vert. Clearance for Highway & Railway.

Runway and taxiway design: Windrose, cross wind component, Runway Orientation and configuration. Basic runway length and correction, runway geometric design standards. Taxiway Layout and geometric design standards, Exit Taxiway.

Unit V :

Airport layout: Airport classification: Terminal Area Aircraft parking & parking system. Unit terminal concept, Aprons, Hangers, internationals Airports layouts, phase development.

Visual Aids: AirPort marking and Lighting for runway, Taxiway and other areas. Air traffic control: Need, network, control aids, instrumental landing systems, advances in air traffic controls.

Unit VI :

Tunnel Engineering: Tunnel alignment, Tunnel Surveys, Tunneling methods in Hard Rock and Soft Grounds, Tunnel lining. Drainage, Ventilation and lighting of tunnels, Advances in Tunneling & Tunnel Boring Machines, Case studies.

Text Books :

1. Railway Engineering: Saxena and Arora, DhanpatRai& Sons
2. Airport Engineering: Khanna and Arora, Nem Chandra & Brothers, Roorkee.
3. Tunnel Engineering: S. Srinivasan, Publishing House Charotar.

Reference Books :

1. Airport Engineering: G.VenkatappaRao, Tata McGraw-Hill Publishing
2. Planning and Design of Airports: Robert Herorjeff, McGraw-Hill Publishing
3. Railway Tracks Engineering: J.S.Mundrey, Tata McGraw-Hill Publishing
4. Introduction to Tunnel Construction: David Chapman, Nicole Metje, Alfred Stark, Span Press, New York.

VIII Semester B.E. (Civil Engineering)

Course code: CET 408 — **Course : Construction Management**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week — **Total credit : 7**

Course Outcomes :

Upon completion of this course, the students will be able to:

1. Summarize construction project management.
2. Assess engineering economy and project appraisal techniques.
3. Evaluate network of the project with various network analysis methods with resource allocation.
4. Describe quality and safety checklist for the construction site.
5. Select different types of construction equipments for various construction activities.

Unit I :

Construction management :

Significance, objective, function, Role of construction manager, Regulations and laws related to construction industry, Need for construction planning, Construction team, preparatory works, Job lay out.

Unit II :

Project management :

Types of Projects, Various phases of Project, Project proposal Components of planning, Objectives of planning, factors effecting planning, Organizational setup, Introduction to Project management software , Project appraisal techniques, Capital budgeting, Benefit cost ratio calculation, Appraisal techniques, Break even analysis, ROR method of analysis, annual equivalent method of analysis , Calculations , Recent topics in project management.

Unit III :

Network analysis :

Bar diagrams and Gantt bar charts, Critical Path Method, P E RT, LO B method, Network preparation and critical path determination, Cost slope concept, Optimization of project cost and simple compression calculation.

Unit IV :

Resource management : Resource Planning, Resource Allocation, Resource leveling Resource based networking and optimization, Material Management: Functions, objectives, purchasing, procedures, Material Stock, Storing, Recording, Inventory control, Inventory control techniques, ABC analysis, EOQ.

Unit V:

Management Information System: System approach to management, Management and systems. Inference Techniques - Use of various statistical methods and tests, graphical representation. Quality control: Principles, Measurements and achievements. Safety management: Planning for safety: safety in construction, industry and work site. National safety council, Safety organization Construction hazards, accidents, its cost, cause, types and preventions

Unit VI :

Equipment management: Classification of Construction equipment's, Factors effecting selection, Standard and special equipment, Owning, Operation and Maintenance cost, Depreciation and Replacement cost, Economic life, down time cost. Construction Equipments: Excavators, Dozers, Hoisting, Hauling equipment's e.g. Power shovels, Drag Line, Bulldozer, Scraper, Drilling and Blasting Equipments, Material Transporting and handling equipment such as Cranes, Hoists, conveyer belts, dumpers, cableways, rail system (Mechanism, Size, performance and limitations)

Text books :

1. Kumar Neeraj Jha, Construction Project Management, Pearson Publication
2. K.K. Chitkara, Construction Project Management, 2nd Edition, McGraw Hill Publication
3. P G. Gahlot and B.M. Dhir, Construction Management New age international (p) Ltd.
4. Srinath L, CPM and PERT, East-West Press Pvt. Ltd New Delhi.

Reference Books :

1. Frank Harris and Ronald Mc. Caffer, Modern Construction Management, Blackwell Science 4th Edition.
2. Project Management Body of Knowledge, 5th Edition, PMI Global Standard
3. Construction Management Dr. U. K. Shrivastav, Galgotia publication.

VIII Semester B.E. (Civil Engineering)

Course code : CET 409-1 | **Course : Elective II - Water Power Engineering**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit : 7**

Course Outcomes :

The students would be able to,

1. Understand the importance of economics issues and hydraulic structures related to water power engineering.
2. Apply knowledge of hydraulics principles and various design methods in the design of penstocks, surge tanks & intakes and hydro power plant.
3. Explain and discuss the hydraulic features, types of hydro power plants and its analysis.
4. Describe and explain the importance, sources and application of non conventional energy.

Unit - I :

Introduction : sources of energy; importance of water power; estimate of power potential; primary & secondary power; load factor; load curve.

Types of hydropower plant: low & high head; run-off-river plant; valley dam; pumped storage plant; reservoir plant. Plant division channel; high head diversion pumped storage underground; general description of layout; topographic requirements of hydropower plant .

Unit - II :

Penstocks: general classification; design criterion; economic diameter; anchorage's accessories.

Water hammer: meaning; equation for uniform diameter penstock; use of Allievi's chart.

Unit - III :

Surge tanks: types; functions; locations; hydraulic design & stability of surge tanks.

Unit - IV :

Intakes: types; locations; trash & other components; control gates; emergency gates, Hydal channel forbay: general principles of alignment and balancing tank.

Unit - V :

Turbines: types; hydraulic features; size; general description and layouts; specific speed; selection criterias.

Unit - VI :

Power houses: types; general layouts and approximate dimensions.

Non-conventional sources of energy: tidal power; wind power; solar power; elementary principles & description; application of non conventional energy.

Text Books :

1. Water Power Engineering by R. K. Sharma and T.K.Sharma,1st edition 2003, S Chand & Company Ltd. Ramnagar, New Delhi.
2. Water Power Engineering by M.M. Deshmukh.

VIII Semester B.E. (Civil Engineering)

Course code : CET 409-2 **Course : Elective II - Earth and Earth Retaining Structures**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes :

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

1. Analyze and design earth retaining structures.
2. Identify, formulate and solve problems related to slope stability.
3. Analyze and design various earth structure like coffer dam, conduits, shafts etc

Unit I :

Earth Pressure on Retaining Walls

Rankine's & Coloumb's earth pressure theories, Poncelet's and Culmann's graphical constructions for active and passive pressure & Effects of wall movement, wall friction, wall angle, backfill slope angle, surcharge & line loads on lateral earth pressure. Direction & point of earth thrust application.

Unit II :

Stability of Earth Retaining Structures:

Types of walls: gravity, cantilever walls, walls with counter forts and relief shelves, typical dimensional details. Stability requirements for overturning, sliding, bearing capacity failure, overall stability against shear failure in backfill & foundation soil, application of geosynthetics in earth retaining structures. Soil nailing,

Unit III :

Sheet Pile Retaining Structures:

Sheet piles walls bulk heads. Types of sheet piles, constructional features cantilever & anchored walls, their suitability, Analysis for design of cantilever walls in cohesionless and cohesive soils, Analysis for anchored sheet pile walls with free end & fixed end support condition. Dead man and anchors: location and design principle

Unit IV :

Underground Conduits, Shaft and Tunnels:

System behavior of different types of underground conduits, loads on ditch and projecting conduits classification, loads on ditch and projecting conduits, Marston's solutions, Imperfect ditch conduit, stress distribution in the vicinity of shafts and around tunnels, arching in soil, practical cases of arching action.

Unit V :

Stability of Slopes:

Friction circle methods, factor of safety, stability numbers and use of stability charts, base, failure stability of earth dam slopes, for steady seepage and sudden draw down. Approximate analysis for plain slip surface, Bishop's method for slope stability, Slope stabilization using soil nailing, ground anchors, gabion wall constructions

Unit VI :

Cofferdams: Types, suitability, stability analysis of cellular and diaphragm type cofferdams, TVA method, interlocked stresses.

Braced Cuts: Sheeting and bracing systems in shallow and deep vertical cuts in different types of soils. Failure modes, lateral pressure distribution on sheeting, stability of bottom of excavation

Text Books :

1. Gopal Ranjan & Rao: Basic &Applied Soil Mechanics, New Age International Publisher, 2005
2. Purshottam Raj: Geotechnical Engineer, McGraw Hill Education, 2000
3. VNS Murthy: Soil Mechanics & Foundation Engineering, Vol.-1, Saikripa Technical Consultant, Bangalore 1991

Reference Books :

1. B. M. Das: Principle of Geotechnical Engineering, Cengage Publications Winterkom H. F & Farg H.: Foundation Engineering Handbook
2. Winterkom H.F. and Fang H. - Foundation Engineering Handbook.

VIII Semester B.E. (Civil Engineering)

Course code: CET 409-3 | **Course: Elective II - Air Pollution and Solid Waste Management**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit: 7**

Course Outcomes :

The students would be able to:

1. Understand and describe various types of air pollutants with its impact along with the control methodology.
2. Know the various air pollution parameters, its determination techniques along with the importance of meteorological parameters in air pollution.
3. Explain and describe the various sources of solid waste, its characteristics, its impact and necessity of solid waste management.
4. Identify and explain various components of solid waste management.

Unit I:

Introduction to air pollution, air pollution episodes, atmosphere and its zone, classification of air pollutants with their sources, effects of air pollutants on man, animals, plants and materials.

Unit II :

Meteorological parameters affecting air pollution, lapse rate and atmospheric stability, plume behavior, wind rose, pollution rose, estimation of stack height, greenhouse effect, atmospheric ozone depletion.

Ambient air sampling, stack sampling, collection of particulate and gaseous pollutants, methods of estimation.

Unit III :

Air pollution control: Principles of control methods for particulates and gaseous pollutants, control of air pollutants by using various equipments.

Automobile exhaust: pollutions due to diesel and petrol engines exhaust treatment and abatement.

Noise pollution: Sources, ill effects, control measures, calculation of weighted noise level index.

Unit IV :

Introduction to solid waste management, Classification, sources, components, quantity and per capita contribution of solid waste, Physical and chemical characteristics, sampling and analysis of solid waste.

Unit V :

Collection and transportation of solid waste: methods of collection, equipments used for collection and transportation of solid waste. Transfer stations and its economic use. Machinery and manpower calculation

Solid waste processing: methods of processing, choice of methods and merits and demerits of various processing methods.

Unit VI :

Solid waste disposal by composting : Principles, methods of composting, factors affecting composting.

Solid waste disposal by sanitary land filling: site requirement, methods, leachate management, calculation of land requirement.

Solid waste disposal by incineration : Principles, types, merits and demerits.

Text Books :

1. Air pollution by M. N. Rao and H. V. N. Rao, (Tata McGraw Hill publications)
2. Environmental Pollution Control Engineering by C. S. Rao, (Wiley Estern Ltd.)
3. Solid waste management in developing countries by A. D. Bhide and B.B. Sundersan (INSDOC, New Delhi)
4. Air Pollution, NEERI Manual

VIII Semester B.E. (Civil Engineering)

Course code : CET 409-4 **Course : Elective II - Multi Storied Structures**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes:

On completion of the course, the students will be able:

1. To analyze the effect of lateral forces due to earthquake on structures.
2. To analyze and design of shear walls for earthquake forces as per Indian standards.
3. To design the components of building considering ductile behavior of materials.
4. To apply technical design principles and techniques such as p-delta effect, soil-structure interaction etc for the design of multi-storied building.

Unit I :

Performance of buildings, behaviors of various type of buildings in past, Earthquakes, modes of failures, influence of unsymmetrical& infill walls. Study of IS 1893-2002.

Unit II :

Analysis of buildings for earthquake using seismic coefficient method.

Unit III :

Analysis and design of shear walled buildings, Concepts of shear wall.

Unit IV :

Special aspects in Multi-story buildings, Effect of torsion, flexible first story, P-delta effect & drift limitation.

Unit V :

Strength, ductility and energy absorption, ductility of reinforced members subjected to flexure, axial loads & shear. Detailing of RCC members, beam, column, Beam-column joints for ductile behaviors, I S code provisions. IS code 13920 1993 ductile detailing.

Unit VI :

Design philosophy of multi-story buildings with Bracings &Infills.

Text Books :

1. Design of Earthquake Resistent Structures - Agrawal and Shrikhande
2. Design of Earthquake Resistent RCC Structures - S.K. Duggal

Reference Books :

1. IS: 1893-2002, 13920-1993, 456-2000, SP-16.
2. Handbook on seismic analysis and design of structures, Farzadneaim
3. Seismic design of R C & masonry Buildings, paulay & Prestiley, John Wiley and Sons.
4. Earthquake resistant Design for engineers & Architects, Dowrick D J
5. Concrete Structures in earthquake regions, Booth E.
6. Reinforced Concrete Structures, Park & Paulay.
7. Analysis of tall building by force-displacement method by M. Smolira, McGraw Hill Publication.
8. Foundation Analysis & design-J.E. Bowls, McGraw Hill Publication
9. High Rise Building Structures-Schelluar.w.
10. Structural Analysis Designing Tall Building- B. S. Taranath, McGraw Hill Book Co. Newyork.
11. Advances in tall buildings - L. S. Beedle, CBS Publication & Distributor, Delhi

VIII Semester B.E. (Civil Engineering)

Course code: CET 409-5 | **Course: Advanced Transporation Engineering**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week | **Total credit: 7**

Course Outcomes :

The students will be able to

1. Describe the procedure for alignment of new highways and explain the quality control tests on highway materials.
2. Design various types of pavements using the latest methodology.
3. Explain about various construction machineries and construction & maintenance methods for various pavement layers.
4. Explain latest techniques for traffic studies, traffic control and managment and Road Safety Audit stages.
5. Describe geometry and structure of modern tracks for high speed trains and geometric design standards, maintenance and rehabilitation of Runways and Taxiways.

Unit :

Highway Alignment & Surveys :

Factors controlling alignment, Fact finding survey, survey for location of new highway, Drawings to be prepared, Case study.

Pavement Materials :

Importance of soil properties with respect to pavement performance, soil stabilization techniques for pavements.

Properties of aggregates, design for aggregate grading.

Bituminous materials and their properties, bituminous mix design.

Unit II :

Geometric Design :

Elements of Geometry for rural highways and urban roads, IRC specifications, sight distance, gradient, horizontal and vertical curves.

Design of Highway Pavements :

Factors affecting pavement design, design of flexible and rigid pavement as per latest codal provisions, joints in rigid pavement.

Unit III :

Highway Construction and Maintenance :

Highway construction machinery, properties of subgrade, WBM, WMM, cement treated bases, bituminous construction, interface treatments, selection of wearing course under different climatic and traffic conditions. Concrete road construction and quality controls. Failure in pavements, maintenance measures, rehabilitation of payment.

Unit IV :

Traffic Engineering and Management :

Road user and vehicle characteristics, traffic studeis, ARSS, capacity and LOS, functional areas of ITS, GIS applications in trafic engineering.

Road Safety :

Five pillars for safe system approach, risk factors, objectives of RSA, Road safety audit at different stages of road projects.

Unit V :

Railway Engineering :

Modernization of track for high speed, high speed and its impact on track structure, structural strength, geometry, maintenance and renewal, track tolerance, track recording, track drainage, safety in railways.

Unit VI :

Airport Engineering :

Geometric design standars for runways and taxiways, maintenance and rehabilitation of airfield payements, terminal area and airport layout, visual aids.

Text Book :

1. Highway Engineering, Khanna & Justo, Nem Chand,
2. Principles and Practices of Highway Engineering, Dr. L.R. Kadiyali, Dr. N.B. Lal, Khanna publishers.
3. Railway engineering : Saxena & arora, Dhanpat Rai & Sons.
4. Airport planning and Design, Khanna & Arora, Nemchand
5. Traffic Engineering and Transport Planning : L R Kadiyali, Khanna Publishers,

Reference Books :

1. Principles of Highway & Traffic engineering, Garber & Hoel, Cengage Learning.
2. Planning and Design of Airports, Fifth Edition, Mc Graw Hill Professional
3. Principles of Pavement Design, E.J. Yoder, M.W. Witczak, WILEY Publishers.

VII Semester B.E. (Civil Engineering)

Course code: CET 409-6

Course : Elective II - Maintenance and Rehabilitation of Civil Engineering Structures

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week

Total credit: 7

Course outcomes:

1. Student shall be able to identify common maintenance problems and classify the maintenance work for a building.
2. Student shall be able to inspect and diagnose factors affecting magnitude of maintenance work and suggest appropriate remedies to it.
3. Student shall be able to select and implement new materials and techniques for repair and retrofitting.
4. Student shall acquire knowledge of structural audit, maintenance manuals, MIS and maintenance oriented design for a building.

Unit I :

Introduction: Definition of maintenance, need for maintenance of civil engineering structures, maintenance characteristics that influences maintenance needs, A study of the cause of neglect and poor maintenance of structures

Classification of maintenance work: servicing, rectification, replacement planned, unplanned, preventive, corrective, predictable and avoidable maintenance work, Renovation and rehabilitation.

Common maintenance problems related to civil engineering structures and systems, Technology of maintenance, Area prone to frequent maintenance. Cause of aggravate maintenance work like high rise building, special construction methods, new materials, difficult accessibility, environment etc.

Unit II :

Factors affecting incidence and magnitude of maintenance work: over loading, movement of ground, temperature variation, moisture leakage and dampness, chemical action and corrosion, growth of trees, earthquakes, flood and fire, riots and vandalism, design defect, defect in construction and use of material, choice of material for durability and maintainability, design expose and other factors affecting durability.

Corrosion in RCC: Type of corrosion, causes of corrosion of embedded reinforcement in concrete, effect of reinforcement, corrosion on concrete. Oxidation process between two metals in contacts and its preventive maintenance

Unit III :

Preventive maintenance: Necessity, Occurrence, techniques, time cost trade off, choice of structural system and material specification and detailing. Maintenance oriented design. Preventive maintenance for structure such as building, roads, dams, canals, water retaining structures etc., Routine and service maintenance, Strengthening and rehabilitation. Service life and expected life. Stability requirements.

Unit IV :

Material and techniques for maintenance: Introduction to repairs and rehabilitation, overview of present repair practices, essential parameters for repair materials, materials for repair like premixed cement, mortar, concrete, Polymer modified mortar and concrete, epoxy and epoxy systems, polyster resins, bonding chemical, superplasticizers, curing compound, sealants, emulsion and paints. Techniques like stiffening, lining, grouting, guniting and protection system.

Repair options, Performance requirements of repair system, important factors to be considered for selection of repair methods, repair stages, repair/rehabilitation strategies. Some example on structural repairs of buildings, bridges, canals road etc.

Unit V :

Maintenance planning: The deeper specification of maintenance as oppose to cosmetic treatments. Broad action plan, planning, budgeting and controlling the cost of maintenance work. Policy formulation, standards of maintenance, controlling cost, planned maintenance

Maintenance manual, their functions, Contents and types, Difficulties in the way of planned maintenance

Structural audit: Inspection, identification and diagnosis of common defects and failure, condition survey, Nondestructive evaluation technique. Structural audit and report preparation with case study.

Unit VI :

Economics of maintenance: The burden of maintenance work and the conflicting interest involved. Various economic factors that affect the maintenance work. Initial and user cost. Impact of inflation on maintenance, Life of structures: structural life and economic life. Basics of life cycle cost techniques.

Maintenance oriented designs: Design and its relation to maintenance. Relationship between initial, maintenance and running costs, Importance of feedback, Feedback systems, Role of design professional

Maintenance management: Need for data. Data relationship of the data base system to management process, Cost data bases and management, Uses of data base, Problems in data collection and use. Setting criteria from data collected, operational assessment.

VIII Semester B.E. (Civil Engineering)

Course code: CET 410 - 1 — **Course : Elective III - Open Channel Hydraulics**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week — **Total credit: 7**

Course outcomes:

The students would be able to :

1. Understand the principles of open channel and design channels for uniform flow
2. Analyse the profiles in channels and apply energy dissipation techniques.
3. Understand unsteady flow in channels and concept of sediment transportation in channels.

Syllabus :

Unit - I Basic Principles : Open channel flow and its classification, energy and momentum principles, critical flow and its computations, transitions. [06 hrs]

Unit - II Uniform Flow : Computation of uniform flow, design of channels for uniform flow (Non-erodible, erodible and grassed channels) concept of boundary layer, surface roughness, velocity distribution of instability of uniform flow [08 hrs]

Unit - III Gradually Varied Flow : Theory and analysis, methods of computations, flow profilesin nonprismatic channels, spatially varied flow [08 hrs]

Unit - IV Rapidly Varied Flow : Flow over spillway, hydraulic jump and its use in energy Dissipation [08 hrs]

Unit - V Unsteady Flow : Derivation of Saint Venant's Equation, waves and their classification, celerity of wave. [08 hrs]

Unit - VI Sediment Transport : Introduction, basic theories of sediment transportation, dunesand ripples, scour criteria [06 hrs]

Text Books :

1. Flow in open Channel by K. Subramanya (McGraw Hill Pub. 1986.)
2. Open Channel Hydraulics by Strum.

References :

1. Open Channel Hydraulics by VenTe Chow (McGraw Hill Pub. 1959)

VIII Semester B.E. (Civil Engineering)

Course code: CET 410-2 **Course: Elective III - Advanced RCC**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

On completion of the course, the students:

1. Would be able to analyze and design a building from foundation to roof level
2. Would be able to analyze and design the on-ground, underground and overhead tanks.
3. Would be able to understand the analysis, design and detailing of building.
4. Would be able to analyze and design small bridges and cylindrical shells.

Unit I

Design of overhead circular service reservoirs, Analysis and design of rectangular (underground, on-ground) and circular (overhead)service reservoirs using IS:3370 coefficients ,Analysis and design of staging for static, wind/earthquake forces using approximate analysis procedure ,Design of foundation - Annular raft, Full raft.

Unit II

Analysis and design of T-beam bridges (3 girders) simply supported ends with load distribution as per Courbon's method, Design of highway bridges with IRC loading and equivalent UDL.

Unit III

Design of building frames upto two bay/two storey, including design of foundation. Using Limit state Method.

Unit IV

Design of Cylindrical shells by beam theory, advantages, assumptions, ranges of validity and beam analysis, Design of shells with or without edge beams

Reference Books:

1. Jain, O.P.; & Jaikrishna, "Plain and Reinforced Concrete (Vol-I&II)", Nem Chnand & Bros; Roorkee.
2. Varghese, P. C., "Advanced Reinforced Concrete Structures", Prentice Hall of India, 2000.
3. Pillai, S.U.; & Menon, D., "Reinforced Concrete Design", Tata McGraw Hill Publishing company ltd. India, 1998.
4. Krishna Raju, N., "Advanced Reinforced Concrete Design (IS 456:2000)", 2nd Edition, CBS Publisher, 2013.

VIII Semester B.E. (Civil Engineering)

Course code: CET 410-3 **Course: Elective III - Industrial Waste water Treatment**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

1. To understand importance of industrial wastewater treatment.
2. To Apply principle of waste minimization for reuse recycling and recovery.
3. To understand the fundamentals of various treatment processes in industrial waste.
4. To understand treatment methodologies for various industrial waste waters.

Sullabus :

Unit - I : Necessity and importance of industrial waste water treatment, Generation of Industrial wastewater, characteristics of industrial waste water and its variation, sampling and analysis of wastewater, statistical analysis of data, standards for wastewater disposal, Environmental impacts due to discharge of wastewater on streams, land and sewerage system;

Unit - II : Basic concept of Reuse, Recycling and Resource recovery; Volume and strength reduction; Construction, working, design parameters and design of Equalization, proportioning and Neutralization and floatation.

Unit - III : Treatment flow sheet of wastewater from various industries viz. Pulp and paper, tanning, Sugar, Dairy, Cement, Fertilizers, Metal Finishing, textile, Etc. Joint treatment of industrial waste.

Unit - IV : Types of biological processes used in treatment of wastewater. Construction, working and design parameters of Stabilization pond, aerated lagoon, oxidation ditch, biological denitrification processes, membrane bioligcal reactors. Anaerobic treatment of industrial wastewater.

Unit-V : Industrial waste survey; Stream sanitation, stream sampling, Stream survey; Principles and techniques for Industrial pollution prevention and control;

References :

1. Nemerow N. L. Theories and Practices of Industrial Waste Treatment, Addison Wesley Publishing CO. N Y . 2 edition.
2. W.W. Ecenfelder, Industrial Water Pollution Control Mc-Graw Hill Book Co. 2nd edition.
3. Freeman H.M., Industiral Pollution Prevention Handbook McGraw Hill 1st.
4. Central Pollution Control Board, India, Comprehensive Industry Document Series.
5. E.B. Besselivievre, The Treatment of Industrial Waste Mc-Graw Hill Book Co.1st

Text Books :

1. Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal And Reuse, Inc. Third Edition Mcgraw Hill 1991.
2. W.W. Eckenfielder, Industrial Pollution Control, McGraw Hill Int. Edition 1990.
3. Nemerow, N.L. Theories and Practices of Industrial Waste Treatment. New York : Addison Wisely.
4. Bess Elivievre, E.B. The Treatment of Industrial Wastes, McgGraw Hill Book co.

VIII Semester B.E. (Civil Engineering)

Course code: CET 410-4 **Course: Elective III - Pavement Design**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

1. The student can design pavement of highways and airfields for different loading conditions taking into account material characteristics.
2. They can do analysis of rigid and flexible pavements.
3. They will be able to conduct testing in field conditions and can apply knowledge to strengthen the pavements.

Unit I

General: Pavement design factors, components of flexible and rigid pavement and their functions, characteristics of highway and airfield pavement.

Design parameters: Design wheel load, Standard axle load and wheel assemblies for road vehicles. Under carriage system for aircraft, tyre and contact pressure, contact area, imprints, computation of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and airfield, pavement, airport traffic areas, Serviceability concept.

Unit II

Material characteristics: AASHO subgrade soil classification, CBR test, North Dakota cone bearing value, plate load test for K-value, modulus of elasticity and Poisson's ratio of subgrade soils, Marshall's method of Bituminous mix design, Surface dressing, Premix carpet, Mix seal surfacing , Semi-dense carpet, Asphaltic concrete, Bituminous Macadam Binder course, Dense Bituminous Macadam Binder course, Modulus of rupture, modulus of elasticity, Poisson's ratio and coefficient of thermal expansion of concrete, Layer equivalent concepts.

Unit III

Analysis of flexible and rigid pavements: Stress, strain, deflection analysis one layer system by Boussinesq's, Two, three layer system by Burmister's and multi layered flexible pavement system. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis joints

Unit IV

Highway Pavement Design: Flexible: North Dakota cone, Design using the latest IRC code, Triaxial (Kansas), AASHTO method of design

Rigid: Design using the latest IRC code, PCA, AASHTO method of design, design of joints and reinforcements.

Unit V

Airfield pavement design:

Flexible: FAA, US Corps of engineering, CBR, Mcleod (Canadian)

Rigid: FAA, PCA & LCN, definitions of ACN, PCN, LCN. Calculation of LCN value, Ultimate load analysis and yield lines patterns method

Unit VI

Pavement testing and evaluation: field density, CBR, plate load test,Pavement Failures in both Flexible Pavement & Rigid Pavement - types and causes, condition surveys and surface evaluation for unevenness, rut depth, profilometers, bump integrators, Benkleman beam deflection study.

Strengthening of pavements: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements

Text Books:

1. Principles of Pavement Design by H.J.Yoder and Witczak, John wiley and sons.
2. Highway Engineering by Khanna O.P, Justo C.G., , Nem Chand Publishers
3. Pavement Analysis and Design by Yang H. Huang 2nd Edition, Pearson Education, Inc., Pearson Prentice Hall Company.
4. Airport Engineering by G VenkatappaRao, Tata McGraw -Hill Publishing Company Ltd.
5. IRC-37(Latest Code))Guide lines for Design of Flexible Pavement
6. IRC -58-(Latest code) Guide lines for Design of Plain Jointed Rigid Pavement for highways
7. MOST Specifications for Road and Bridge Works, 1994 (Third Revision)

Reference Books:

1. Airport Engineering by Khanna and Arora, Nemchand & Brothers.

VIII Semester B.E. (Civil Engineering)

Course code: CET 410-5 **Course : Elective III - Rock Mechanics**

L: 4Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 8**

Course Outcomes :

1. To make the students understand engineering properties of rock, classification of rocks
2. Laboratory testing fo rocks, failure criteria, tunneling in rocks.
3. Various techniques to improve the in situ strength of rocks.

Syllabus

Introduction to rock mechanics : Scope and application of rock mechanics, engineering classification of intact and fissured rocks, RQD, rock exploration, geotechnical description of rock mass.

Engineering properties of intact rock : Porosity, void index, permeability, ultrasonic and electrical resistivity, uniaxial compressive strength, Brazilian test, Coulomb's theory, Griffith's theory of failure in tension and compression, elastic and dynamic constants, time dependant behaviour, various creep models, applications in mining works.

Engineering properties of jointed rock: An isotropy, deform ability and shear strength, rock discontinuity, friction along a joints, residual strength, stick-slip theory, Barton's - Chaubey's correlation for shear strength, shear stiffness and dilation.

In-site stress in rock masses : Analysis of stresses, thick wall cylinder formulae, Kreish equation, Green span method, opening in rock mass and stresses around opening, Borehole deformation meters, borehole inclusion stress meters, borehole strain gauge devices.

Underground excavation and subsidence, bearing capacity of homogeneous as well as discontinuous rocks, support pressure & slip of the joint, delineation of types of rock failure, unsupported span of underground openings.

Field tests : Plate load test, shear strength test.

Stability of rock slopes : Modes of failure, prevention and control of slope failure, introduction to rock bolting.

Text Book:

1. Rock mechanics in engineering practice : Stag and Zienkiewiz, John wiley & sons
2. Fundamentals or rock mechanics : Jagger, J.C. & Cook, N.G.W., Methuen & Co. 1971
3. Rock mechanics & Design of structures : Obert, L & Duvall, W.I., John Wiley & Sons

Reference Books :

1. Rock mechanics for engineers : Varma, B.P., Khanna Publishers
2. Introduction to rock mechanics : Goodman, Wiley International

VIII Semester B.E. (Civil Engineering)

Course code: CET 410-6 **Course : Elective III - Building Services**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

CO1 : Students will be to understand role of construction manager in building services.

CO2 : Students will be able to design water distribution system for building.

CO2 : Student will be able to analyze HVAC system and fire fighting services.

CO3 : Students will be able evaluate building services based on environmental impact.

Syllabus

Unit - I :

Importance of building services, Role of Construction Manager, Planning and designing of building services.

Unit - II :

Water supply and Distribution to Multi-storey buildings, De-centralized water Treatment units and Swimming pool for building complexes, storm water drainage and Rain Water Harvesting, sanitation services - Soil Pipe system, de-centralized waste water Treatment, Solid Waste Disposal System.

Unit - III :

Lift and Escalators, Fire Fighting Services, HVAC systems and services, Building security and Access services, Acoustic and Integrated Services, Design of Parking Systems, Lighting design.

Unit - IV :

Integrated planning and Designing of Different services in Important Buildings viz. Multi-storeys / High Rise Building, Institutional Building, Auditorium and stadiums, Office Complexes, Shopping complexes.

Reference :

1. National Building Code 2005, Part 0-10, Bureau of Indian Standards.
2. F. Hall (Author), Roger Greeno (Author), Building Services Handbbok : Incorporating Current Building and Construction Regulations.
3. Building Services Research and Development Association Staff Building Services Materials Handbook-Heating, Sanitation and Fire Routledge.
4. Willan T. Mayer Energy economics and building design.
5. E.C. Butcher and A.C. parnell. Designing for Fire safety.
6. Peter R. Smith and Warden G. Julian, Building Services.
7. V.K. Jain, Handbook of Designing and Installation of Services in High Rise Building & Complexes, Khanna Publication, new Delhi.

VIII Semester B.E. (Civil Engineering)

Course code: CET 411-1 **Course: Elective IV - Applied Remote Sensing and GIS**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes :

The students should be able to

1. Identify, describe and explain the fundamental of principles of aerial photography and remote sensing.
2. Apply the basics of raster and vector data formats and able to interpret it.
3. Asses and compare spatial and non-spatial data, projection system, topology, geo referencing while using remote sensing data.
4. Collect logical information and apply digital image processing for supervised/un-supervised classification of given data

Unit I :

Definition and scope of remote sensing: electromagnetic energy and its wavelengths. Remote sensing systems, sensors and scanners, resolution of sensors, multi-spectral, thermal and radar scanners, radiometers spectral response curve and spectral signatures

Unit II :

Elements of sensing system: Terrestrial, airborne and space borne platforms, Sun-synchronous and geo-stationary satellites, advantages and disadvantages. Various earth Resources satellites, Indian remote sensing program. Remote-sensing data products and their types: analogues and digital data formats, Thermal and radar imageries.

Unit III :

Interpretation techniques: Elements of interpretation and methods, interpretation key, interpretation instruments. Relief displacement, image parallax and vertical exaggeration, Determination and calculation of elevation from RS data

Unit IV :

Digital image processing: image rectification and restoration, image enhancement-contrast manipulations, spatial feature manipulation, multi-image manipulation, image classification supervised and unsupervised classification, accuracy assessments and data merging.

Unit V :

Geographical Information System: Raster and vector data, concepts and basic characteristics of vectorization, topology generation, attribute data attachment, editing and analysis.

Global Positioning System: Introduction to Global Positioning System (GPS) - Fundamental concepts, GPS system elements and signals, Classification of GPS receivers.

Unit VI :

Applications: Integrated approach of RS and GIS application: Application in Geological Investigations, water resources management, environmental studies, EIA based studies, Land use planning, soil studies and transportation planning. Application in civil engineering projects damns and bridges, site investigations, landslide studies.

Text Books:

1. Remote sensing Geology: Ravi P Gupta, Springer publication
2. Remote sensing and GIS: Anji Reddy ISBN publication.
3. Remote Sensing: Sabins, Floyd F
4. Higher surveying volume III: Dr B C Punmia

VIII Semester B.E. (Civil Engineering)

Course code: CEP 411-1 **Course: Elective IV - Applied Remote Sensing and GIS**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

The students should be able to

1. Interpret the aerial photographs based on parameters for of various objects, rocks, drainage roads etc.
2. Plan and apply decision making using GIS software for proper thematic output.
3. Analyze and compare the raw data, corrected data with field observation.
4. Collect the logical digital data from sensors for its evaluation in various civil engineering fields.

List of Practicals :

1. Study of stereoscope
2. Study of aerial photographs based on elements of interpretation
3. R S Data format and their study: analogue and digital data products
4. Geo-referencing of G I S data/ Topo-sheet
5. Calculations on RS data: elevation, spatial attributes
6. To Transfer the principal point and draw a flight line on the aerial photographs
7. Assignments based on relief displacement, no. of photographs scale height etc.
8. Calculation of parallax using parallax bar.
9. Calculation of parallax using algebraic definition of parallax.
10. Study of Arc-GIS 10. Software
11. Study ENVI 5.0 image processing software.
12. Calculation of an area of irregular polygon using digital planimeter

VIII Semester B.E. (Civil Engineering)

Course code: CET 411-2 **Course: Elective IV - Traffic Engineering**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcome :

After the completion of the course in Traffic Engineering, the student should be able to:

1. Define and describe the various road user characteristics and also the traffic studies to be carried out for the improvement in traffic stream.
2. Apply the various statistical tools to analyze the traffic data.
3. Explain, discriminate and design various geometric features of roads and also the traffic controlling devices.
4. Describe the causes of road accidents and suggest the remedies which can improve the traffic safety.
5. Analyze the traffic data and design traffic signals and parking facilities as per need.

Unit I

General: Road, road user &road vehicle characteristics, traffic on Indian roads.

Traffic Surveys: speed, journey time and delay studies, methods of measurement of spot speed, headways gaps, measurements of running and journey speeds, origin and destination surveys, survey methods, sample size, data analysis &presentation, highway capacity, level of service.

Unit II

Traffic Events: Statistical method for interpretation, regression, application of binomial, normal and Poisson's distributions, discrete and continuous distribution of traffic flow, test of significance, Chi-square & 't'test.

Unit III

Road geometry: Hierarchy of urban roads and their standards, diverging, merging, crossing, weaving, maneuver's and conflict points, types of road junction, channelization of traffic flow, traffic rotary design, grade separated intersections, drive ways.

Unit IV

Traffic controlling devices: Traffic signs, road markings, traffic signals, design of signalized intersections & signaling systems, Queing theory

Unit V

Traffic Safety: Driver's error, vehicle & road surface laws and enforcement, traffic accident conditions in India, collection and interpretation of accident data and recording in standard Format, skidding, speed and weather effects on accidents, analysis of accidents, pedestrian, cyclist& auto vehicle driver's safety, traffic regulation, 3E's of traffic management.

Unit VI

Parking: Parking surveys, on and off-street parking & parking systems, parking demand, design of off-street parking lot, underground &multistoried parking, introduction to urban traffic.

Text Books:

1. Highway Engineering: (1991) Khanna S.K. and Justo C.E.G.,Nem Chand & Bros.
2. Traffic engineering and transportation planning: (1987) L.R. Kadiyali, Khanna Publications

Reference books:

1. Transport planning and Traffic Engineering, edition Latest, C A O'Flaherty, Butterworth Heinemann Publications.
2. Introduction to Transportation Engineering, edition Latest, James H Bank, Tata McGraw Hill Publications.
3. Transportation Engineering an Introduction, edition C. Jotin Khisty, PHI Publication.

VIII Semester B.E. (Civil Engineering)

Course code: CEP 411-2 **Course: Elective IV - Traffic Engineering**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

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

1. Carry various traffic studies like speed studies, volume studies, origin and destination studies, accident studies and parking studies etc.
2. Design traffic signals and intersections.
3. Carry out road safety audit.

Practicals :

1. Speed studies
2. OD studies
3. Design of traffic signals
4. Design of intersection
5. Design of Rotaries
6. Road safety studies
7. Traffic volume studies
8. Parking studies

VIII Semester B.E. (Civil Engineering)

Course code : CET 411-3 **Course : Elective IV - Water and Waste Water Treatment**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit : 7**

Course Outcomes:

The students would be able to,

1. Describe and explain the necessity of water treatment, various treatment processes along with the knowledge of various principles, theories and equations
2. Understand various design parameters and its importance and also design of various units in water treatment plant
3. Describe and explain the necessity of waste water treatment, knowledge of various principles, theories and equations in treatment processes and its disposal
4. Understand various design parameters and its importance and also design of various units in waste water treatment plant

Unit I :

Objective of water treatment, unit operation and unit processes, treatment flow sheet and site selection for water treatment plant.

Aeration: objective of aeration, types of aerators, design of cascade aerator, gas transfer, two film theory, Time of exposure of gravity aerator and driving head, associated carry & rise for spray aerator.

Unit II :

Coagulation- Flocculation: Theory of coagulation, objectives, types of rapid and slow mixing devices (hydraulic and mechanical), factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids. Design of flash mixer and mechanical flocculator

Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling, design of sedimentation tank and Clariflocculator

Unit III :

Filtration: mechanism of filtration, types of filters, design of rapid sand filters, filter media specifications, preparation of filter sand from stock sand, problems in filtration.

Disinfection: Method of disinfection, kinetics of disinfection, types of disinfectants. Chlorination: method of chlorination, breakpoint chlorination, factors affecting efficiency of chlorination.

Iron and manganese removal, defluoridation & recent development in water treatment.

Unit IV :

Physical and chemical characteristics of waste water, BOD curve, BOD equation, BOD test, determination of BOD rate constant.

Disposal of sewage by dilution and by land disposal, Oxygen sag curve and application of Streator - Phelps's equation in oxygen sag curve.

Unit V :

Treatment Methods: Waste water treatment flow sheet, preliminary and primary methods of treatment, design of screen, girt chamber and primary settling tank.

Unit VI :

Biological unit processes: principles of biological treatment processes, activated sludge process and its types, trickling filter and its types, process design calculations of activated sludge process and trickling filters. Construction and working of stabilization pond, aerated lagoon and oxidation ditch.

Sludge treatment: aerobic and anaerobic digestion and sludge drying beds (excluding design) Recent development in waste water treatment

Text Books :

1. Wastewater Engineering by Metcalf & Eddy (Tata McGraw Hill)
2. Water supply Engineering Vol-I & Waste water Engineering Vol-II by B.C. Punmia (Laxmi Publication)

Reference Books :

1. CPHEEO Manual of water supply & treatment
2. CPHEEO Manual on Sewerage & sewage treatment.
3. Water treatment by A.G. Bhole (IWWA Publication)
4. Water supply & Sewage by M.S. Macghee (Tata McGraw Hill)

VIII Semester B.E. (Civil Engineering)

Course code: CEP 411-3 **Course: Elective IV - Water and Waste Water Treatment**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

The students would be able to,

1. Determine the characteristics of water and wastewater.
2. Apply the knowledge of drinking water standards and disposal standards and identify the types and degree of treatment required.
3. Analyze and understand the importance of various process parameters and also design of various units in water treatment plant.
4. Analyze and understand the importance of various process parameters and also design of various units in waste water treatment plant.

List of Practicals :

A) Minimum 5 of the following

1. Determination of pH of waste water sample
2. Determination of solids in wastewater sample
3. Determination of available chlorine
4. Determination of BOD
5. Determination of COD
6. Jar test
7. Selection of filter sand from available stock sand
8. Bacteriological test (MPN Test)
9. Determination of Sulphate in Sample (Titrametric / Spectrophotometer)

B) Minimum 8 assignments based on water and waste water treatment.

1. Flow sheet of conventional water treatment plant
2. Design of cascade aerator
3. Design of flash mixer
4. Design of rectangular flocculator
5. Design of circular flocculator
6. Design of rectangular sedimentation tank
7. Design of circular sedimentation tank
8. Design of circular clariflocculator
9. Design of Rapid Sand Filter
10. Flow sheet of conventional waste water treatment plant
11. Design of bar screen
12. Design of grit chamber
13. Design of Primary sedimentation tank
14. Analysis of Oxygen Sag curve

VIII Semester B.E. (Civil Engineering)

Course code: CET 411-4 **Course: Elective IV - Water Transmission and Distribution System**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week **Total credit: 7**

Course Outcomes:

The students would be able to,

1. Describe and explain the importance of various parameters involved in the study of WDS including analysis of various components water supply systems.
2. Elaborate and discuss the hydraulic and economic principles with its application to component design in water distribution networks.
3. Apply knowledge in formulating the mathematical equations, models and obtaining the solutions.
4. Explain and discuss various methods of analysis of water distribution networks.
5. Design and evaluation of various components of water distribution networks, size of service reservoirs, design of pumping main. Concept of optimization of branched and looped water distribution networks.

Unit I :

General Hydraulic Principles : Frictional head loss in pipes, different formulae, minor head loss in pipes, equivalent pipe.

Reservoir Pumps and Valves: Impounding reservoir, Service and balancing reservoir, three reservoir system, Multi reservoir system, pumps and pump co-ordinations, Types of valves, Analysis of reservoir system with checks valves and pressure reducing valves.

Unit II :

Analysis of Water Distribution Networks: Types and parameters, Parameter relationship, Formulation of equations, Analysis of network using Hardy Cross method, Newton Raphson method and linear theory method, Introduction of gradient method and Dynamic analysis.

Unit III :

Node Flow Analysis (NFA): Difference between Node Head and Node Flow Analysis, Necessity of NFA, Bhave's approach- Node classification, node category compatibility, NFA theory. Introduction to other NFA methods- Germanopolus approach, Wagner ethal approach, Gupta and Bhave's approach.

Unit IV :

Reservoir capacity: Estimation of minimum required reservoir capacity using graphical and analytical method. Design of pumping main: Optimal design of pumping main considering pipe diameter as continuous and discrete variable.

Unit V :

Design of Water Distribution Networks: Design of single source branching networks using critical path method, number of branching, configuration of looped networks using Graph Theory principles, selection of branching configuration using path concept and minimum spanning tree concept. Design of single source looped networks using critical path method.

Unit VI :

Optimal Design Water Distribution Networks: Cost Head Loss Ratio (CHR) method- CHR criterion, Problem formulation, CHE methodology for single source branching networks. Linear programming formulation and solution using simplex method, Introduction of Non- Linear Programming based approaches.

Text books :

1. Bhave P. R. and Gupta R. (1991), "Analysis of flow in water distribution networks", Technomic Publishing Co. Lancaster, Pennsylvania, USA.
2. Bhave P. R, "Design of Water Distribution Networks" Technomic Publishing CO. Lancaster, Pennsylvnia, USA.

Reference Books :

1. Jeppaon R.W. (1977), "Analysis of Flow in Pipe Networks'' Ann Arbor Science. Ann Arbor Michigan, USA.
2. Walski. T.M. (1984),'' Analysis of flow in water distribution networks'' Technomic Publishing CO. Lancaster, Pennsylvnia, USA.

VIII Semester B.E. (Civil Engineering)

Course code : CEP 411-4 **Course: Elective IV - Water Transmission and Distribution System**

L: 0Hrs, T: 0Hrs, P: 2 Hrs per week **Total credit: 2**

Course Outcomes :

The students would be able to,

1. Describe, explain and apply the various analytical methods in the study of WDS including analysis of various components of water supply systems.
2. Elaborate and discuss the hydraulic and economic principles with its application to component design i n water distribution networks.
3. Apply knowledge in formulating the mathematical equations, models and obtaining the solutions.
4. Design and evaluation of various components of water distribution networks with the application of Concept of optimization in branched and looped water distribution networks.

List of Practicals :

Minimum 8 of the following

1. Water distribution network analysis by Hardy cross method.
2. Water distribution network analysis by Newton Raphson method.
3. Water distribution network analysis by Linear theory method.
4. Water distribution network analysis by Gradient method.
5. Water distribution network analysis by Node flow analysis.
6. Design of water distribution network using critical path method.
7. Design of water distribution network using cost head loss ratio method.
8. Design of water distribution network using software TORA of Linear programming technique.
9. Design/ analysis of water distribution network with the application of software like Loop, Branch, EPANET, Water GEMS or Water CAD.
10. Conversion of Loop network into branch network using minimum spanning tree concept / Path length concept / Graph theory.
11. Pressure Dependant Demand (PDD) analysis of water distribution network.

VIII Semester B.E. (Civil Engineering)

Course code: CET 411-5 **Course : Elective IV - Ground Improvement**

L: 4Hrs, T: 1Hrs, P: 2 Hrs per week **Total credit : 7**

Course Outcomes:

1. To endable students to identify problematic soils and their associated issues.
2. Students will study the various ground improvement techniques.
3. Also, to propose suitable remedical techniques and design.

Syllabus

Introduction to ground improvement techniques : Concepts of and essential requirements of ground improvement, classification of ground improvement techniques, economic considerations and suitability.

Compaction and Consolidation : Equipments and control of field compaction, surface compaction and deep compaction, virofloatation. Preloading and static loads and by vacuum, accelerated consolidation by sand drains, free strain and equal strain cases, design of sand drain layout.

Stabilization : Methods of stabilization, mechanical stabilization, organic and inorganic stabilizing agents and their characteristics - lime, cement, lime, flyash, bitumen and chemicals, stabilization by electro-osmosis.

Grouting : Materials and methods of grouting, grout volume and grounting pressure, grout requiremtns and tests, grouting of rock foundation of dams.

Reinforced earth and Geotextiles : basic theory of reinforced earth, materials, method, application and design of reinforced earth, characteristics of reinforced earth masses; geotextiles, geogrids and geosynthetics, their basic features, functions and applications.

Stone columns : Application, layout feature, procedures of installation, vibrofloat and rammed stone column, unit cell concept, load tranfer mechanism, settlement in stone column, methods of improving the effectiveness of stone column, Design for stone column layout for intended requirements.

Introduction to soil nailing ground anchors and gabion walls.

Text Books :

1. Ground Imrovement Techniques : P.P. Raj, Prentic Hall of India (2005)
2. Engineering Principles of Ground Modification : M.R. Housmann, McGraw Hill (1990)
3. Foundation Engineering manual : By N. V. Nayak

Reference books :

1. Constructional and Geotechnical Methods in Foundation Engineering : R.M. Koerner, McGraw Hill (1985)
2. Design and Construction of Stone Column : FHWA Report No. Rd 83/026, (1983)

VIII Semester B.E. (Civil Engineering)

Course code: CEP 411-5 **Course : Elective IV - Ground Improvement**

L: 0Hrs, T: 1Hrs, P: 2 Hrs per week **Total credit : 2**

Course Outcomes:

1. Student will have an ability to suggest suitable ground improvement techniques.
2. Student will have an ability to design and layout of propose techniques.

The term work shall consist of analysis and design for any THREE of the following design assignments to be carried out by each studnet individually (with different data).

1. Design of sand layout in soft compressible clay deposit for required (accelerated) rate of consolidation.
2. Design of a reinforced earth retaining wall.
3. Design of stone column layout (using conventional incremented fill material orcemented granular fill material) for intended degree of improvement in safe load carrying capacity of soft soil ground.
4. Analysis and design of skirted stone columns.

   The work shall be submitted in the form of a journal and shall be assessed by concerned teacher/s through viva-voice examination.

VIII Semester B.E. (Civil Engineering)

Course code: CET 411-6 — **Course: Elective IV - Bridge Engineering**

L: 3Hrs, T: 1Hrs, P: 0 Hrs per week — **Total credit : 7**

Course Outcomes:

On completion of the course, the students will be able:

1. To analyze the functional utility of bridges and their components.
2. To determine the forces acting on bridges and to calculate bending moment, shear force etc.
3. To understand the behavior of components of bridge due to load and able to design it for safety and serviceability.
4. To understand the support conditions, the functional utility and use of bearings.

Unit I : Loading Standards

Unit II : Design of Balanced Cantilever Bridge

Unit III : Design of Bow String Girder Bridge

Unit IV : Design of prestressed concrete girder and box girder bridges considering only primary torsion, Design of end block

Unit V : Bridge Bearing: Types of bearings, Elastomeric bearing.

Unit VI : Piers, Abutments, Wing walls factors effecting and stability, Well foundations. Design of well, Construction, Open well, sinking of walls, Plugging, Sand filling and casting of well cap.

Text Books :

1. D. J. Victor - Essentials of bridge engineering, Oxford and IBH publications New Delhi
2. T. R. Jagdeesh and M.A.Jayaram - Design of bridge structures, Prantice - Hall of India
3. N. KrishnaRaju- Design of bridges, Oxford and IBH publications New Delhi
4. V. K. Raina- Concrete bridge practice analysis, design and economics, Tata McGraw Hill Publication
5. IRC codes: 5, 6, 18, 27, 45, 78, 83, SP-13
6. David Lee- Bridge bearings and expansion joints, E and FN Spon.
7. S. Ponnuswaney, bridge engineering, Tata McGrawHill Publication

VIII Semester B.E. (Civil Engineering)

Course code: CEP 411-6 — **Course: Elective IV - Bridge Engineering**

L: 0Hrs, T: 1Hrs, P: 2 Hrs per week — **Total credit : 7**

Course Outcomes:

The students will be able to

1. Determine the forces acting on Bridge and to calculate Bending Moment, Shear Force, etc.
2. Design the RCC Simply supported / Balanced Cantilever Deck Slab for IRC Loadings.
3. Understand Prestressing Methods and design of Prestressed Concrete Deck Slab for IRC Loadings.
4. Understand the use fo Bridge Bearings and their Design Aspects.
5. Understand the use of various foundations, their suitability and design.

List of Practical :

Practical shall consist of minimum 5 Design Assessments with detailed Drawing on A-2 size sheets and detailed calculations in Journal.

1. Design of RCC Simply supported / Balanced Cantilever Deck Slab for IRC Loadings.
2. Design of Prestressed Concrete Deck Slab for IRC Loadings.
3. Design of Bridge Bearings.
4. Design of Well Foundation.
5. Design of Pile Foundation.

One filed visit and its Report writing in Journal.

VIII Semester B.E. (Civil Engineering)

Course code: CEP 412 **Course: Project**

L: 0Hrs, T: 0Hrs, P: 6 Hrs per week **Total credit: 12**

Course Outcomes:

The students would be able to;

1. Demonstrate conceptual and technical knowledge for understanding and analyzing the problems.
2. Solve the problems using modern tools and technique.
3. Work in a team and communicate technical details.
4. Draft technical report on a project.

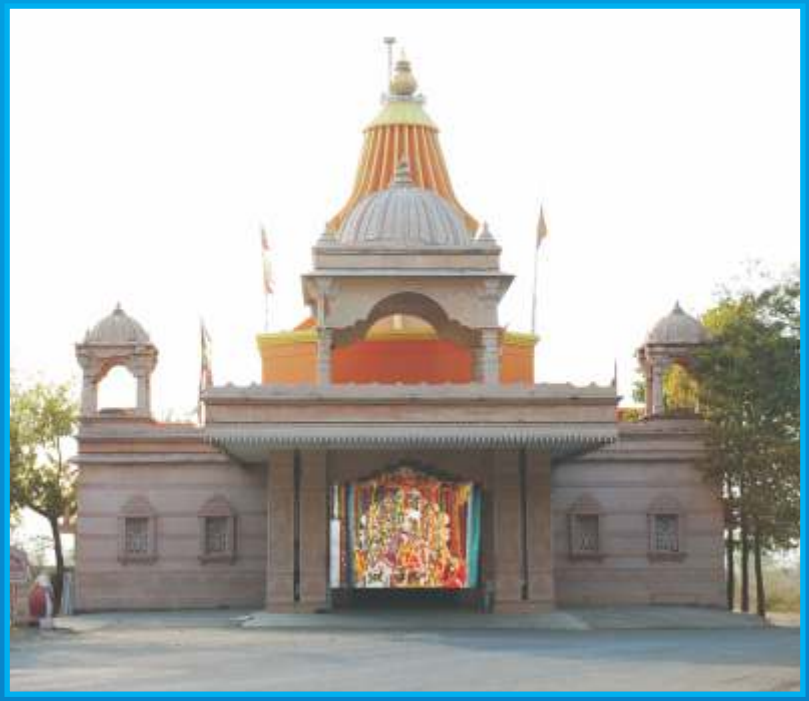
Syllabus:

The student will carry out the Project work in a group which is finalized in VIIth semester and submit a project report at the end of the semester.

Each group shall deliver seminar/seminars on the project work done during the semester.

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR

Ramdeobaba Tekadi, Gittikhadan, Nagpur - 440013
Ph. : 0712-2580011 / Fax : 0712-2583237
Website : www.rknec.edu



Shri Ramdeobaba Temple on Campus

Print Tech, Ngp. M.9373104407