SHRI RAMDEOBABA
COLLEGE OF ENGINEERING
AND MANAGEMENT, NAGPUR

An Autonomous College of Rashtrasant Tukadoji Maharaj
Nagpur University, Nagpur, Maharashtra, India

TEACHING SCHEME & SYLLABUS
2014-15

B.E. CIVIL ENGINEERING DEPARTMENT

Published by
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ISO 9001 : 2008 CERTIFIED ORGANISATION

Civil Engineering Department

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.

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 Education Objectives and Outcomes. (Department of Civil Engineering)

Programme Education Objectives (PEO):

The graduate shall be able to:

1. Demonstrate the competence in various civil engineering fields as practicing engineer/entrepreneur/researcher/academician or to pursue higher studies.

2. Enhance the technical ability to deal and execute various civil engineering problems.

3. Exhibit managerial skills, ethical values and engage themselves in lifelong learning in the context of technological changes.

Programme Outcomes:

At the end of the program BE Civil Engineering, the student will be able to;

1. Exhibit knowledge of civil engineering and basic sciences.
2. Identify, formulate and analyse civil engineering problems of various domains.
3. Design and solve various civil engineering components with environmental, social and safety considerations.
4. Comprehend and solve interdisciplinary engineering problems through system approach.
5. Select and apply modern engineering tool, software and state of art equipment to solve civil engineering problems.
6. Demonstrate the understanding of social, cultural and legal issues in professional activities.
7. Knowledge of contemporary issues such as effect of technology on environment and importance of sustainable development.
8. Integrate the knowledge of values and professional ethics in their activities.

9. Demonstrate the ability to participatory learning and working in group as a member or leader to accomplish target.
10. Prepare reports to present and communicate technical information effectively.
11. Plan, organize and manage civil engineering projects with effective use of financial and human resources.
12. Adopt and adapt technological changes through skill up gradation for lifelong learning.

DEPARTMENT OF CIVIL 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	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	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	-	-	-	-

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	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	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	INT101	Engineering Drawing	3	0	0	6	40	60	100	4 Hrs.
7	INP101	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	-

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	-	-	-	-

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 & 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**				

Scheme of 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 & Drawing	1	1	0	3	25	25	50	3 Hrs.
9	CEP305	Building Design & Drawing	0	0	2	2	25	25	50	--
10	CET306	Hydrology & Water Resources	4	1	0	9	40	60	100	3 Hrs.
11	CEP307	Technical Writing	0	0	2	0	-	-	-	-

Scheme of 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 & Costing	3	1	0	7	40	60	100	4 Hrs.
2	CEP308	Estimating & 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

Compulsory one month training after 6th Semester examination to sites such as flat scheme, bridges, roads, surveying, software etc. to be evaluated as a part of CEP406 i.e. project and seminar.

Scheme of 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	CET 401	Advance Concrete Structures	3	1	0	7	40	60	100	4 Hrs.
2	CEP 401	Advance Concrete Structures	0	0	2	2	25	25	50	--
3	CET402	Irrigation Engineering	3	1	0	7	40	60	100	3 Hrs.
4	CEP 402	Irrigation Engineering	0	0	2	2	25	25	50	--
5	CET 403	Contract, Accounts & Works Management	3	1	0	7	40	60	100	3 Hrs.
6	CET 404	Elective - I	3	1	0	7	40	60	100	3 Hrs.
7	CET 405	Structural Analysis II	3	1	0	7	40	60	100	3 Hrs.
8	CEP 405	Structural Analysis II	0	0	2	2	25	25	50	--
9	CEP 406	Project & Seminar	0	0	2	4	50		50	--

Course Code	Elective I
CET 404 - 1	Advanced Construction Materials
CET 404 - 2	Maintenance & Rehabilitation of Civil Engineering Structures
CET 404 - 3	Advanced Hydraulics
CET 404 - 4	Advanced Geotechnical Engineering

Scheme of 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	--

Course Code	Elective II	Course Code	Elective III	Course Code	Elective IV
CET 409 - 1	Water Power Engineering	CET 410 - 1	Advanced Steel Design	CET 411 - 1	Remote Sensing & GIS
CET 409 - 2	Earth & Earth Retaining Structures	CET 410 - 2	Advanced RCC	CET 411 - 2	Traffic Engineering
CET 409 - 3	Air Pollution & Solid Waste Management	CET 410 - 3	Bridge Engineering	CET 411 - 3	Water & Waste Water Treatment
CET 409 - 4	Multi Storied Structures	CET 410 - 4	Pavement Design	CET 411 - 4	Water Transmission & Distribution

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 Outcomes :

Upon successful completion of the course, the student should be familiar with and be able to

1. Formulate and analyze mathematical problems, precisely define the key terms, and draw clear and reasonable conclusions.
2. Read, understand, and construct correct mathematical model for simple electrical circuits, mechanical systems and other related engineering problems.
3. Apply techniques of differential calculus to obtain the solution of mathematical models of physical systems and use optimization technique.
4. Continue to acquire mathematical knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematics

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 $d^2y/dx^2 = f(x)$ and $d^2y/dx^2 = f(y)$.

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 free, 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 VidhyarthiGrihaPrakashan, 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.

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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 :

Upon successful completion of the course, the student should be familiar with and be able to gain

1. Knowledge of water analysis, waste water analysis, boiler water chemistry and desalination of water enable the students to overcome the difficulties, to a larger extent; that often come across in the field of i) Civil engineering, ii) Public health and environmental engineering iii) Ocean engineering iv) thermal and electrical power generation sectors and process engineering.
2. Better understanding to surmount over the difficulties faced in the selection of proper and economical constructional materials to be used; the impact of change in the physicochemical and mechanical properties of the concrete type composites due to variation in their chemical composition.
3. There are many different ways in which the abundant energy around us can be harnessed converted and exploited for our use. The ability to harness and its use for constructive purposes as economically as possible is a challenge before mankind. Under these circumstances it is imperative that sustainable energy sources with less attardent problems are developed to meet the ever increasing energy demand. The course content related to energy recourses incorporated in the syllabus fulfills the basic requirement for having acquaintance with the field. Application of knowledge of conventional sources of energy used in thermal, electrical, nuclear power, generations; harnessing new vistas to upgrade and uplift unconventional sources of energy.
4. To apply the knowledge of 'Principles of Tribology' for reduction of friction and wear in the process engineering, manufacturing and production engineering and automotive engineering fields.
5. Shall help to judiciously select and design proper engineering materials having better corrosion resistance and sustainability and implement the effective measures to minimize the corrosion wherever possible.
6. Better insight in the selection of materials for modern technologies which demand with unusual combination of properties that cannot met by any of the conventional metal alloys, ceramics and polymeric materials viz in aerospace applications, military warfare materials, nuclear installations, electrical electronic components devices, nanotechnology materials process engineering field etc.
7. Air acquaintance with all kinds of pollution hazards, combating measures to minimize these in the day to day working; to adopt / to develop better skill to assess the environmental impact on the surroundings and its result oriented management to off load the pollution emissions in almost all walks of various engineering disciplines.

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

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**

Minimum of **Eight** practicals will be performed based on the theory.

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

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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 successful completion of the course, the student should be familiar with and be able to

1. understand the different laws of electric and magnetic circuits.
2. Students will understand the vector representation of electrical quantities, power factor and its improvement.
3. Understand the concept generation, transmission and distribution.
4. Learn and understand the necessity of electrical earthling, safety and protecting devices.
5. Learn and understand construction, principle, applications and performance evaluation methods of transformer, D.C. Machine, Induction Motor.
6. Learn about the illumination sources and their selections.
7. Understand the basic philosophy of energy tariff.

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

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, sleep, torque speed 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.

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

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

Course Outcomes :

Upon successful completion of the course, the student should be familiar with and be able to

1. Understand the different laws of electric and magnetic circuits.
2. Understand the vector representation of electrical quantities, power factor and its improvement.
3. Understand the concept generation, transmission and distribution.
4. Learn and understand the necessity of electrical earthling, safety and protecting devices.
5. Learn and understand construction, principle, applications and performance evaluation methods of transformer, D.C. Machine, Induction Motor.
6. Learn about the illumination sources and their selections.
7. Understand the basic philosophy of energy tariff.

List of Experiments :

1. To verify Kirchoff's voltage and current law using D.C. source.
2. To plot the magnetization curve (B-H) for magnetic material of transformer
3. To study the R-L-C series circuit with AC source
4. To study R-L-C parallel circuit with AC source
5. To perform direct load test on 1-phase transformer for finding regulation and efficiency
6. To perform open circuit and short circuit tests on 1-phase transformer
7. To study 3-phase star delta connections and verify different relations
8. To study the speed control techniques for DC shunt motor

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

Course Code: CST101 **Courses: 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. Design and code well-structured C programs, flowcharts, algorithms etc.
2. Write program on the basis of decision control structures and loop control structures.
3. Perform sorting and various other operations on 1-D and 2-D array.
4. Perform operations on structures, functions and pointers.

Syllabus

Unit-I:

Computer Fundamentals: Basic Structure of a computer, Input/output devices and memories and 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 Language System Software- Translator, Compiler, Interpreter, Linker, Loader. Languages – Procedural, Object oriented, High level, assembly, Machine Language 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, continueStorage class, 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: CSP101 **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 CST101 syllabus

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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 Objectives :

The main objective of the subject is to enhance the employability skills of engineering students as well as communication skills at work place. The sub-objectives are:

1. To develop students' reading skills and pronunciation.
2. To develop technical communication skills through drafting, letter writing, and précis writing.
3. To develop literary skills through essay writing.
4. To develop public speaking skills of the students.
5. To expose the students to the ethics of English language by teaching grammar

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 Practical**

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, English Edge software
3	Group Discussion-Orientation	1. GD types 2. GD techniques/rules - videos 3. General/familiar topics for discussion	English Edge software Oxford Publication CD, 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	English Edge software Oxford Publication CD Activity Based
7	Interview Techniques Practice Sessions	1. Video 2. Non-verbal communication 3. Types of interview questions	Oxford Publication CD, Activity Based
8	Interview Techniques-Mock Interviews	1. Mock Interviews (One to One)	Activity Based
	Optional Practicals	**Teacher can decide any other Practical apart from the ones mentioned below**	
9	Listening Skills	1. Listening Barriers	PPT Based, Activity Based
10	Non Verbal Communication	1. Kinesics in com/interviews 2. Activities/Role play	English Edge software based, PPT based
11	Use Figurative Language	1. Intro phrases/ Idioms/proverbs/	PPT Based, Activity

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. More number of students are participating in sports activities.
2. Students interest toward physical fitness has been increased.
3. Students are getting basic knowledge of yoga & sports.

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. Organizing intramurals ie. Fresher's cup- volleyball(G& B), Cricket (G& B), Sadbhavana volleyball(mix team of B& G), Sadbhavana cricket (mix team of B& G).
6. 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, body

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 Outcomes :

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

1. Identify, formulate and analyze statistical problems, precisely define the key terms, and draw clear and reasonable conclusions.
2. Read, understand and analyze problems in Fluid dynamics, Electromagnetic fields and related topics using techniques of vector algebra and calculus.
3. To use the knowledge of multiple integrals in finding the area and volume of any region bounded by the given curves.
4. Continue to acquire mathematical and statistical knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematics.

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 $y = a + bx + cx^2$ 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 VidhyarthiGrihaPrakashan, 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)

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

1. Develop a better understanding of physics as a fundamental discipline;
2. Gain understanding of the type of questions addressed by theories in and methods of physics in different fields of engineering;
3. Develop a deeper appreciation of the notion of applying knowledge of physical laws;
4. Deepen understanding of certain basic tools, such as state of a system, system response, resonance, coherence, superposition and interference, in thinking about and analyzing physical systems;
5. Gain an understanding of developing areas in physics and their possible engineering applications;
6. Develop ability to choose a physical approach to understanding of advanced areas in engineering;
7. Be comfortable with fundamental ideas in areas like semiconductor, electronic devices, fibre optic communication and quantum mechanics;
8. Gain familiarity with the language, fundamental concerns, techniques and applications of nanoscience and nanotechnology

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, grating; Bragg's law of crystal diffraction, Different types of polarization of light, Malus' law, Optically anisotropic materials, double refraction, wave-plates and compensators, production and analysis of polarized light.

Unit-II:

Quantum Physics:

Wave-particle duality, wave packets, Heisenberg uncertainty relations; Wave function, probability and probability current, Schrodinger's equation, time dependent equation and its separation; Infinite potential and

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:

Elements of Crystal Structure, Mass Spectrograph and Particle Accelerators:

Lattice and basis, crystal systems, centering, Bravais lattices, cubic system, principles of electron optics, 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, bipolar junction transistor, band diagrams of pnp and npn transistors, transistor action.

Unit-VI:

Nanophysics:

What is Nanotechnology? Fullerenes and nanoparticles; Outline of methods of preparation; Elements of electron microscopy; Outline of properties – physical, thermal, optical, electrical, magnetic; Quantum size-effects; CNTs and molecular electronics; 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).
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: P.K. Palaniswamy, Scietech (2005).
3. Engineering Physics: H. Malik and A.K. Singh, TMH (2010).
4. Engineering Physics: D.K. Bhattacharya and A.Bhaskaran, Oxford University Press (2010)
5. Materials Science and Engineering – A First Course, 5th Ed., V. Raghvan, PHI Learning.

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

1. Study of interference in thin films: Formation of Newton's rings
2. Study of diffraction: Transmission diffraction grating
3. Study of diode rectifier equation: Ordinary p-n junction and Zener diode characteristics
4. Study of transistor action: Transistor characteristics in common emitter configuration
5. Study of Hall effect: Determination of Hall coefficient of an extrinsic semiconductor
6. Study of energy bandgap in semiconductor: NTC thermistor bandgap determination
7. Study of rectifiers: Determination of ripple factor for half, full and bridge rectifiers
8. Linear least squares fit on a PC: Fitting a straight line to measured (x,y) sets
9. Study of double refraction: Quartz prism
10. Interference in wedge-shaped thin films: Refractive index of liquids, diameter of a wire
11. Use of CRO: Frequency and phase difference determination

Demo experiments: Laser kit to demonstrate diffraction, optical fibre to demonstrate signal attenuation, Interactive Mathematica demonstrations on polarization, wave packets, tunneling, charge particle dynamics and semiconductor devices

Reference Books:

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

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

On successful completion of the course, the subject knowldge will be able to

1. Develop students to acquire knowledge of static and dynamic behavior of the bodies.
2. Develop students to acquire the knowledge, so that they can understand physical phenomenon with the help of various theories.
3. Develop students, who will be able to explain the physical phenomenon with help of diagrams.
4. Develop students with a broad vision with the skills of visualizing and developing their own ideas, and to convert those ideas in to engineering problems and solving those problems with the acquired knowledge of the 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

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 Publications.

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.

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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**

Minimum of Eight Practical will be performed based on the theory

List of Experiment

1. Simple Lifting machines
2. Law of machine for Differential Axle and Wheel
3. Law of machine for Single Purchase Crab
4. Law of machine for Double Purchase Crab
5. Equilibrium of force systems
6. Jib Crane (Equilibrium of concurrent Forces)
7. Simple Beam (Equilibrium of Non-concurrent Forces)
8. Friction & Flywheel
9. Inclined Plane (Coefficient of friction using Inclined Plane)
10. Belt Friction(Coefficient of friction using coil friction set-up)
11. Fly-Wheel (Mass moment of Inertia of fly-wheel)
12. Resultant of concurrent force systems
13. Resultant of Non-concurrent force system
14. Reactions for simply supported beams
15. Forces in members of simple Trusses

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

Course Code: INT101	**Course : Engineering Drawing**
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week	**Total Credits: 06**

Course Outcomes :

1. Ability to draw & read technical drawings.
2. Ability to prepare the sheet layout for the given drawing.
3. Ability to convert 2-D drawing to 3-D drawing & vice-versa.
4. Ability to understand the various positions of planes, solids in the different orientations.
5. Ability to develop the solid surface for sheet metal working.
6. Ability to use drafting package (AutoCAD).

Syllabus (Only First Angle Method of Projection)

Unit 1

Drawing Instruments.Lines, Lettering & Dimensioning.

Scales - Plain Scale & Diagonal Scale.Vernier Scale.

Engineering Curves - Ellipse, Parabola & Hyperbola.

Methods to be covered:

Ellipse: Directrix Focus, Concentric Circles & Rectangle Method.

Parabola: Directrix Focus, Oblong- Rectangle & Parallelogram Method.

Hyperbola: Directrix Focus & Asymptote Method.

Unit 2

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

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

Unit 3

Projections of Planes - Polygonal Lamina, Circular Lamina.

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

Unit 4

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

Unit 5

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

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

Unit 6

Introduction to AutoCAD: Drafting Basics, Drawing Commands, Modify Commands, Dimensioning.

Text Books :

1. Engineering Drawing by N.D. Bhatt, Charothar Publishing.
2. Engineering Drawing by D. A. Jolhe, TMH
3. Engineering Drawing by K.L. Narayana& P. Kannaiah, SciTech Publication.

Refrences :

1. Engineering Drawing by Dhawan

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

Course Code: INP101 **Course: Engineering Drawing**

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

Course Outcomes :

1. Ability to draw & read technical drawings.
2. Ability to prepare the sheet layout for the given drawing.
3. Ability to convert 2-D drawing to 3-D drawing & vice-versa.
4. Ability to understand the various positions of planes, solids in the different orientations.
5. Ability to develop the solid surface for sheet metal working.
6. Ability to use drafting package (AutoCAD).

Syllabus

Sheet No.1: Scales & Curves (5 Problems)

Sheet No.2: Projection of Lines (4 Problems)

Sheet No.3: Application of Lines (4 Problems)

Sheet No.4: Projection of Planes (4 Problems)

Sheet No.5: Projection of Solids (4 Problems)

Sheet No.6: Projection of Section of Solids & Development of Surfaces (3 Problems)

Sheet No.7: Isometric Projections (3 Problems)

Sheet No.8: Orthographic Projections (3 Problems)

Any TWO of the above sheets should be solved by using AutoCAD.

Text Books :

1. Engineering Drawing by N.D. Bhatt, Charothar Publishing.
2. Engineering Drawing by D. A. Jolhe, TMH
3. Engineering Drawing by K.L. Narayana& P. Kannaiah, SciTech Publication.

Refrences :

1. Engineering Drawing by Dhawan

Syllabus of Group 1- Semester I and Group 2-Semester II, 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
- Human resources and Economic Development: Size and growth, sex composition, age composition, density of population and urbanization growth, population as retarding factor and population policy in India.
- 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. S. Shabbir, A.M. Sheikh, and J. Dwadashiwar (2010 reprint) A New Look Into Social Sciences, (5th edition, 2008), S. Chand and Co. Ltd., New Delhi
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), Aastha Publications, Nagpur
4. Tariq Modood, Multiculturalism (Themes for 21st Century Series)(1st Publication 2007), Polity Press, Cambridge, U.K. ISBN-13:97807456-3288-9.

Course Code : INP102	**Course: Workshop**
L: 0 Hr., T: 0 Hrs., Per week	**Total Credits : 02**

List of Experiments

(A) Carpentry shop

1) Introduction of carpentry tools, equipments, machine, material & process.
2) Manufacturing of Carpentry joints.
3) Turning practice on wood working lathe.
4) Demonstration and practice on universal wood working machine.

(B) Fitting shop

1) Introduction of fitting tools, equipments, machine, material & process.
2) Manufacturing & fitting practice for various joints & assembly.
3) Drilling, tapping and pipe threading operations.

(C) Welding shop

1) Introduction of welding tools, equipments, machine, material & process.
2) Fabrication of joints like Lap, Butt, Corner, 'T' etc.
3) Fabrication of Lap joint by spot welding process.

(D) Smithy shop

1) Introduction of smithy tools, equipments, machine, material & process.
2) Forging of combined circular/square/hexagonal cross section.

Text Books:

1. Elements of Workshop Technology Vol -I by HajraChoudhari
2. A course in Workshop Technology Vol -I by B.S. Raghuwanshi
3. Production Technology (Manufacturing process) by P.C Sharma

Reference Book:

1. Workshop Manuals
2. Manufacturing Technology by P.C Sharma
3. Workshop Manual by Kannaiah Narayanan

THIRD SEMESTER

III Semester B.E. (Civil Engineering)

Course Code: MAT201	**Course: Engineering Mathematics–III**
L:3Hr., T:1 Hrs., P:0 Hrs., Per week	**Total Credits : 07**

Course Outcomes :

1. Student can form mathematical modal corresponding to engineering problems.
2. Partial diffential equation & their solution based on heat equation and wave equation
3. Student should understand concept of matris algebra and Eigen Values and Eigen vector, Eigen Value problem.
4. They can solve the problems numerically and analyze its physical and graphical interpretation.

Syllabus

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 diffferantial 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, RungeKutta method

Text Book :

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.

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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 Outcome :

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 analyse 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

Type of force distribution, concept of stress and strain, stress strain behaviour of ductile andbrittle material in uniaxial state of stress. Elastic, plastic and strain hardened zones stress-strainrelations, 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

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

Reference Books:

1. Strength of Materials – A practical Approach: D. S. Prakash Rao – Universities Press, Hyderabad, 1999.
2. Graphical Methods in Structural Analysis: D. S. Prakash Rao – Universities Press,
3. IS 1608: 1995 Indian standard Mechanical Testing of Metals _ Tensile Testing, Bureau of Indian standards, New Delhi,1995

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 credit : 2**

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 any ten experiments.

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 :

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

1. Understand and apply the basic fluid properties in solving the practical problems.
2. Understand the concept of fluid pressure and its variation and also able to measure fluid pressure in different practical situations.
3. Apply the basic laws of conservation of mass, energy, and momentum of fluid in solving the problems of fluid flow.
4. Understand the kinematic of fluid flow, effect of variation of velocity and acceleration on fluid flow.
5. Understand and identify the forces responsible for fluid in motion
6. Understand principles of kinetics of fluid flow to solve the problems of fluid flow.
7. Identify the equipments which are useful in handling the real problems.
8. Know the constructional details and working principles of various equipments.
9. Understand of application of dimensional analysis in the prototype and models.

Unit I :

Concepts of fluid, difference between solid , liquid and gases, basic properties of fluids, dynamicand kinematic viscosity, Newton's law of viscosity, vapor pressure, effect of pressure andtemperature on fluid properties, rheological diagram.Fluid pressure, variation of Fluid pressure with depth, pressure head, atmospheric, gage, vacuumpressure, relationship with diagram,

Unit II :

Pressure measurement using simple and differential manometer. Hydrostatics pressure on plane surface, center of pressure, total pressure, problems.Fluids in relative equilibrium, fluid masses subjected to horizontal, vertical and inclined acceleration. Buoyancy and Floatation: Buoyant force and center of buoyancy, Archimedas principle,metacentre. Stability of floating bodies and three states of equilibrium.

Unit III :

Kinematics of flow: Velocity and its variation with space and time. Acceleration of fluid particals, normal and tangential acceleration. Lagrangian and Eularian approaches in fluid flow discrition, type of flows, stream line, path line, and streak line.

Equation of continuity in Cartesian co-ordinates system. Stream functions, velocity potential functions, free and forced vortices, source, sink and circulation concept.

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 factors.

Unit V :

Measurement of discharge :

Discharge measuring equipments through pipes using venturimeter, Orifice meter, and velocity using pitot tube.

Orifices and mouth pieces- Definition, types Hydraulic coefficients.Large orifices and submerged orifices. External and Internal, running free and running full Mouthpieces,

Notches &Weirs : Defination, 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 models

Dimensional Analysis Definition and use, fundamentals and derived dimension, methods.

Dimensionless number,

Theory of models - Similitude, types of similarities i.e. Geometric, Kinematic and Dynamic similarities, Model laws – Reynolds and Froude & its application.

Text Books :

1. Hydraulics and fluid mechanics, 8th ed.: Dr. P. N. Modi and S. M. Seth, Standard book house.
2. Introduction to fluid mechanics and fluid machines, 2nd ed.: S. K. Som and G. Bishwas, Tata McGraw Hill Publishing Company.
3. Fluid mechanics – fundamentals and applications: YunusCengel, John M. Cimbala, Tata McGraw Hill Publishing Company, 7th reprint 2009.

Reference Books :

1. Fluid mechanics through problems, 2nd ed.: R. J. Garde, Wiley Eastern Ltd.
2. Theory and Application of Fluid Mechanics, 1st ed.: K. Subramanaya, Tata McGraw Hill Publishing Company.
3. Fluid Mechanics – Fundamentals and applications: Yunuscentgel, Jhon M Cimbala, Tata McGraw Hill Publishing Company 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 will be able to :

1. Operate the equipment according to its working principles.
2. Plan & perform experiments as per the aim.
3. Identify the important parameters involved.
4. Select the equipments as per requirements to solve practical problems.
5. Analyse the experimental and theoretical performance of equipments and discuss it.

List of Practical's

Any eight experiments based on the following :

1. Determination of Metacentric height.
2. Verification of Bernolulli's Theorem.
3. Determination of major and minor losses for G I pipe.
4. Determination of coefficient of discharge for venturimeter and orifice meter.
5. Determination of Hydraulic coefficients of orifice, mouthpiece.
6. Determination of coefficient of discharge of Notches.
7. Velocity measurement by Pitot tube.

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 :

The Course outcomes are measures of effectiveness of the of the course learning, which are as follows:

1 The students will be able identify the various types of soil

2 The students will be able to determine the various Index properties of soil

3 The students will be able to find out various Engineering properties of soil.

4 The students will be able to use the various instruments to find out shear strength of soil.

Unit I :

Introduction: Formation of soil, residual & transported soil, Major deposits found in India. Soil solids generally used in practice such as sand, gravel, organic soil, clay, Betonite, Hard pan,calliche, peat, loam, black cotton soil etc. Types of clay minerals.

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

Unit II :

Index properties & their determination, water content, specific gravity, sieve analysis, particle size distribution curves, sedimentation analysis, differential and free swell value. Consistency of soil Atterberge limits, Density index, methods of determining insitu density soil

Classification of Soil: Criteria of classification particle size classification, Unified & I.S. classification system field identification Expansive soil, their identification and related problems. Latest techniques to tackle expansive nature.

Unit III :

Permeability: Darcys law & its validity. Discharge & seepage velocity, factors affecting permeability. Determination of coefficients of permeability by laboratory and field methods, permeability of at stratified soil.

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

Unit IV :

Stress Distribution: Stress distribution in soil mass, Boussinesque, point load, Uniformly loaded rectangular & circular areas, Newmarks charts. Effective neutral and total stresses in soil mass.

Unit V :

Consolidation: Compression of laterally confined soil, Terzaghis 1-D consolidation theory (formation of Differential equation) determination of coefficient of consolidation, degree of consolidation. Determination of pre-consolidation pressure, settlement, rate of settlement.

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

Unit VI :

Shear Strength: Introduction, Mohr's diagram, Mohr Coloumb's theory, Measurement of shearstrength by direct shear test, tri-axial test ,unconfined compression test, vane shear test, sensitivity. Drainage condition, Pore pressure and its measurement.

Text Books:

1. Soil Mechanics in Theory and Practice: Alam Singh, Asia publisher and distributor, 1975 & later.
2. Soil Mechanics and Foundation Engineering: K. R. Arora, Standard publisher and distributor, 1989 & later.
3. Soil Mechanics and Foundation Engineering: B. C. Punmia, Laxmi publication Pvt. Ltd. New Delhi and distributor, 1994 & later.

Reference Books:

1. Basic and Applied soil Mechanics: GopalRanjan& A. S. Rao, New edge international Ltd.2004
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 : 0 Hrs, T : 0Hrs, P : 2 Hrs per week **Total credit : 2**

PRACTICAL

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.

These shall comprise of ten experiments and terms work to be presented in the form of journal for assessment of sectionals and practical examination.

List of Experiments :

1. Moisture content.
2. Specific gravity of soil.
3. Grain size Analysis – Sieve Analysis
4. Atterberge limits
5. Permeability by constant head of falling head test
6. Proctors compaction Test.
7. Field Density determinations by sand replacement method.
8. Field Density determinations by core cutter method.
9. Unconfined compression strength test.
10. Direct shear Test.
11. Triaxial compression test (Demonstration)
12. Strength test on Blend soil.
13. To find F.S.W. and D.F.S. of soil. Identification of swelling soil.

One field visit & its Report to be included in journal.

III Semester B.E. (Civil Engineering)

Course code CET204 **Course: Engineering Geology**

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

Course Outcomes :

1. The students would have the knowledge of principles of engineering geology.
2. The students would have the knowledge of properties of soil, various rocks and minerals
3. The students would be able to judge the suitability of sites for various civil engineering structures.
4. The students would exhibit the ability to use the knowledge of geological strata in the analysis and design the civil engineering structures.
5. The students would have the knowledge for deciding the suitability of water and soil conservation projects.

Unit I :

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 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, Matamorphic rocks, agents and kinds of metamorphisam, textures, structures, and classification of metamorphic rocks, grades of metamorphism.

Unit III :

General geology : Scope of engineering geology, internal structure of earth, continental drift and plate tectonics, isostasy and diastrophism. Geomorphology : definition and scope, basic concepts, internal and external process, geological action of wind, running water and resulting landforms.

Unit IV :

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.

Unit V :

Surface and subsurface investigation methods, geophysical: Seismic, electrical, gravity, and magnetic. Volcanoes, types and their products. Earthquakes, causes and effects, magnitude and intensity, earthquake zones of India, Seismograms, elastic rebound theory.

Unit VI :

Geohydrology : Occurrence, availability and movement of ground water, techniques of groundwater recharge, Aquicludes, aquifuges, aquifer and aquitards, confined and unconfined groundwater, principles of stratigrphy, geological time scale, physiographic and tectonic divisions ofIndia, Landslides, causes and preventions.

Text Books :

1. Geology for engineers: FGH Blyth
2. A text book of Engineering Geology: Parbeen Singh
3. A test book of Minerology: H. H. Reads &Ruffeys

Reference Books :

1. A Principles of Petrology: G. W. Tryrell
2. Structural Geology: M. P. Billings.
3. Mining Geology: Asogyaswami
4. Numerical on Structural geology: Chiplonkar
5. Numericals on Structural geology: SatyanarayanSwamy

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:

1. Students will be able to distinguish between rock forming one forming & gem varieties of minerals & know their physical properties.
2. Students will be able to identify various rocks in suitable constructions sites.
3. With knowledge of Geological maps students will be able to analyses & identify various hydrological zones, suitability of site for tunnels, bridges etc.
4. Students can use knowledge of orientations of strata for various site suitability for civil engineering spectra etc.
5. Various structural features like folds,faults, joints will give idea of cracks, fractures in varsities of strata for proper construction of civil engineering projects.

List of Practicals:

1. Megascopic study of rock 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: CHT201 **Course: Environmental Studies-I**

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

Course Outcomes :

a) Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

b) 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.

c) 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.

d) By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.

e) 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, environmentaleffects of extracting and using mineral resources, case studies. (d) Food resources: World foodproblems, changes caused by agriculture and overgrazing, effects of modern agriculture,fertilizer-pesticide problems, water logging, salinity, case studies. (e) Energy resources: Growingenergy 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 naturalresources.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, structureand function of the following ecosystem (Forest ecosystem, Grassland ecosystem, Desertecosystem, 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 andlocal 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 ofIndia; 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

IV Semester B.E. (Civil Engineering)

Course Code: CET205 **Course: Structural Analysis-I**

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

Course Outcomes :

1. 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.
2. The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams, frames, trusses and columns under various loading conditions using different analysis methods.
3. The student would be able to apply knowledge to determine forces in determinate and indeterminate structures.
4. 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 theorem of three moment.

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. at 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.

Unit VI :

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

Text Books :

1.Theory of structures : S. P. Timoshenko

Reference Books :

1. Structural Analysis : R. C. Hibbeler
2. Structural Analysis : S. B. Junnarkar

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**

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 indeterminacy and learn to find the indeterminate reaction.
4. Students should observe the buckling shape of Column under various end conditions

Practicals :

Minimum Ten of the following:

1. To find slope & deflection of beams.
2. To the value of Flexural Rigidity (El) 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
15. To calculate and draw influence line diagram for horizontal reaction of two hinged arch.

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

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

Course Outcomes :

On the completion of course, the students :

1. Will be able to understand the quality of various construction material.
2. Will be able to design various types of shallow foundation for load bearing structures.
3. Will be able to prepare plan of staircase block.
4. Will be able to supervise the various construction activities at the time of actual execution.
5. Will be able to identify and select the materials for construction activities.

Unit I

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.

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 such as header, stretcher, English and Flemish bonds, principles of construction. Reinforced brickwork.

Parapets, copings, sills and corbels, brief introduction to cavity walls, load bearing and partition walls.

Masonry construction using cement concrete blocks Perforated, paving, hollow blocks, fire clay bricks, AAC block.

Plastering : Necessity, types and its procedure of construction.

Precast construction introduction, precast elements likes poles, cover, jallies, steps, truss element etc.

Unit III

Stone Work : Stones, cutting and dressing, selection of stones types of stone masonary, principles of construction, joints in masonry. Lifting heavy stones, common building stones in India. Artificial building stones, uses and application of stones. Stone cladding.

Pointing: Necessity, types of pointing.

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

& Arches.

Unit IV

Floors : General principles, types and method of construction upper floors finishes quality and testing floor tiles, synthetic & Ceramic Tiles. New techniques and materials used for flooring. Manufacturing of vitrified tiles.

Roofs : Flat and pitches roofs, roof coverings types and their constructional features, Thermal Insulation, Innovative roofing material used Ex. FRP

Unit V

Stairs: Types of stairs, functional design of stairs.

Introduction of Lift and Escalators.

Doors and Windows: Purpose materials of construction and types.

Unit VI

Temporary Timbering: Centering and formwork shoring, underpinning and scaffolding.

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

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

Damp Proofing: Causes and effect of dampness. Various methods of damp proofing. Damp proofing in plinth protection, protection.

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: Sushil Kumar.

Reference Books:

1. Engineering Materials: Surinder Singh.
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 :

Upon the completion of the course, student will :

1. Understand the importance and necessity of water supply.
2. Determine the capacity of water supply scheme.
3. Know about conveyance of water and various appurtenances.
4. Know characteristics of water, drinking water standards and necessity of treatment.
5. Understand the various unit operations and unit processes in water treatment and flow sheet of conventional municipal water treatment plant.
6. Design various units of municipal conventional water treatment plant.
7. To know about various components of distribution system and should be able to determine the reservoir capacity.
8. Have broad idea regarding 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, fittings and testing methods of pipe lines..

Hydraulic design aspects: Mannings, Darcy's, & Hazen-William formulas.

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

Unit III :

Water quality: Physical, Chemical and bacteriological characteristics of water, Standards of drinking water and environmental significance of various characteristics. General idea of waterborne diseases, Water treatment: Objective of treatment unit operations and unit processes, treatment flow sheet of conventional 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, Principals, 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, 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.

Unit VI :

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

Generation, sources, composition, quality, methods of collection, transportation, treatment anddisposal.

Text books :

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

Reference books :

1. Water Supply and Sewerage By M.J. McGhee (McGraw Hill)
2. Water Supply Engg. By P. N. Modi(Standard Book House)

IV Semester B.E. (Civil Engineering)

Course code: CEP207 **Course: Environmental Engineering-I**

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

Course Outcomes :

Upon the completion of the course, the student will be able to :

1. Determine the various characteristics of water.
2. Prepare standard solutions and reagents for water analysis.
3. Find out the type of treatment required for a given water sample to make it suitable for drinking.
4. Understand various instrumentation methods used in water analysis.
5. Understand the importance of water analysis, drinking water standards and treatment.

Practicals :

Minimum Ten of the following :

1. Determination of pH
2. Determination of Conductivity
3. Determination Chlorides
4. Determination of Solid's
5. Determination of Turbidity
6. Determination of Alkalinity – Acidity
7. Determination Dissolved Oxygen
8. Determination Hardness
9. Determination Available Chlorine in bleaching powder
10. Determination of Residual Chlorine
11. Jar Test
12. Bacteriological Plate count test
13. Bacteriological MPN tests.
14. Determination of nitrogen.

IV Semester B.E. (Civil Engineering)

Course code CET208 **Course: Concrete Technology**

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

Course Outcomes :

1. The students should be able to check and recommend different constituent of concrete.
2. The students should be able to control method of manufacture of concrete.
3. The students should be able to test strength and quality of plastic and set concrete.
4. The students should have understanding of application admixture and its effect on properties of concrete.
5. The students should be able to understand the effect of process of manufacturing on different properties of concrete.
6. The students should be able to understand various environmental factors which affect durability of concrete, analyse cause of deterioration of concrete components and to suggest various preventive measures to it.
7. The students should be able to design mix of concrete according to availability of ingredients and design needs.
8. The students should be able to apply corrections to designed mix by degree of quality control and field corrections.
9. The students should be able to test various strength of concrete by destructive and nondestructive testing methods.
10. 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 batchmix 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.

Introduction to formwork for 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.

Unit IV :

Mix Design

Statistical parameters of quality control

Factor affecting mix proportions

I S 10262-1982 method of mix design

Numerical 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.

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

Concept of durability of concrete

Unit VI :

Working stress method

Introduction to the working stress method of R C C 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 by Santhakumar, Oxford publication, New Delhi
2. Reinforce concrete design by Pillai and Menon, Mcgraw Hill

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IV Semester B.E. (Civil Engineering)

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

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

Outcomes :

1. The student shall be able to check general quality of constituent by field testing.
2. The students shall be able to prepare sample of cement, aggregates and concrete for testing by standard methods.
3. The students shall be able to determine physical properties of cement, sand and coarse aggregate and to analyze there significance on quality of concrete.
4. The students shall be able to prepare concrete sample for given grade by standard procedure.
5. The students shall be able to test the workability of concrete and to analyse its suitability for different structural components.
6. The students should be able to test compressive strength of concrete by destructive tests.
7. The students should be able to test compressive strength of concrete by non destructive tests.

List of Practical : Any **TEN** to be performed

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 :

1. Determination of particle shape. Elongation and Flakiness index of aggregates.
2. Determination of finess modulus of aggregate and drawing particle size distribution curve.
3. 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 cover meter.

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 :

1. The students would be able to do temporary and permanent adjustments.
2. The students would be able to measure distances and angles.
3. The students would be able to orient and draw the various maps.
4. The students would be able to calculate areas and volumes of the earth work.
5. The student would be able to undertake various civil engineering surveys and convert the data into usable forms.

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 –Dip-Traversing - Local attraction

Unit II :

Levelling

Basic definitions, Dumpy level, Leveling staffs, Simple Leveling, Terms in Leveling, Precautions, Differential Leveling. Field Book for Leveling, Profile leveling, Cross-sectioning & Reciprocal leveling, 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 –Advantages and Disadvantages of 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, Measuring horizontal andvertical angle, Optical Theodolites, Electronic Digital Theodolites, Selection and marking of stations for traversing, Angular measurements.

Traverse Adjustments

Balancing angles of the traverse, computation of latitudes & departures, consecutive & independent coordinates,Checks for open and closed traverses, Adjustment methods for a traverse, Gales traverse table,Omitted measurements.

Unit VI :

Hydrographic surveying : shore line measurement, soundings, three point problem Study of box sextant, clinometers, Planimeter, theory, 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 :

4. Y. R. Nagraga& A. Veeraragavan; Surveying Vol. I, Nem Chand Bros., New Delhi
5. 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**

Outcomes :

1. Students will be able to measure distance accurately.
2. Students will be able to measure angles and directions.
3. From distance and direction, students will learn to calculate co-ordinates and will be able to define location.
4. Instruments required to measure distance, direction and angles to required industrial accuracy can be handled by students.

Any eight practical's :

1. Measurement with chain and tape, ranging, offsets
2. Closed traverse by chain and compass plotting and
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 o f elevation of various points by Height of collimation methods
7. Fixing bench mark by Flylevelling
8. Cross leveling of a road
9. Contour survey and plotting
10. Measurement of horizontal and vertical angles.
11. Traversing by theodolite.
12. Study of minor instruments

IV Semester B.E. (Civil Engineering)

Course Code: CHT202 **Course: Environmental Studies-II**

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

Course Outcomes:

a) Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

b) 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.

c) 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.

d) By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.

e) 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 andindustrial wastes; Role of an individual in prevention of pollution, Pollution case studies; Diastermanagement: floods, earthquake, cyclone and landslides.

Unit II :

Social Issues and the Environment: From Unsustainable to Sustainable development; Urbanproblems 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 ofPollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, ForestConservation Act, Issues involved in enforcement of environmental legislation; Publicawareness.

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 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, 2nd ed.: R. Rajagopalan, OxfordUniversity Press, New Delhi.
3. Text Book of Environmental Studies: E. Bharucha, University Press (India) Private Ltd., Hyderabad, India.

FIFTH SEMESTER

Semester V, B.E. (Civil Engineering)

Course Code: CET301 **Course: STEEL STRUCTURES**

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

Course Outcomes :

On completion of course -

1. Students will be able to explain the behaviour 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 critique and optimize various steel structures.
4. Students will be able to develop skills to analyze and design a structure while working in a team

Unit – I (10 hrs)

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 (10 hrs)

1. Design of simple and builtup beams,Laterally restrained and unrestrained (symmetrical as well as unsymmetrical section),Curtailment of flange plates.

Unit – III (10 hrs)

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

Unit – IV (10 hrs)

1. Structural Fasteners:

a. Behaviour 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.(bending and torsion)

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

Text Books:

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

Reference Books :

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning

Semester V, B.E. (Civil Engineering)

Course Code: CEP301	**Course: STEEL STRUCTURES**
L:0Hr., T:0 Hrs., P:2Hrs., Per week	**Total Credits : 02**

Course Outcomes :

1) Student will be able to analysis and design tention 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.

Semester V, B.E. (Civil Engineering)

Course Code: CET302 **Course: Environmental engineering - II**

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

Course Outcomes :

1. The students would be able to understand the knowledge of water contamination and its effects.
2. The students would be able to determine the quantity of wastewater and storm water production.
3. The students would be able to design the sewer running full or partially full and also gain the knowledge of construction of new sewer line and importance of sewer appurtenances.
4. The students would be able to understand the importance and planning of house plumbing system.
5. The students would be able to understand the various characteristics of wastewater and its significance in sewerage project.
6. The students would be able to understand of necessity of treatment, types of treatment processes and disposal methods.
7. The students would have understanding of preliminary, primary and secondary treatment units and should be able to design preliminary and primary units of conventional wastewater treatment plant.
8. The students would have broad idea regarding rural sanitation and industrial wastewater treatment processes.
9. The students would have broad idea regarding air pollution: sources, effects and control of air pollutants.

Unit-I :

- General Aspects of Environmental Engineering: 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, etc.)

Unit - II :

- Construction of sewer - Procedure for laying of sewer to grade, testing of sewer line
- Sewer Appurtences - manhole, street inlets, storm water overflows, inverted syphons, flushing and ventilation.
- House plumbing systems - sanitary fitting and appliances, traps and its types, anti-syphonage, and inspection chambers.
- 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 and trickling filter.
- 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 & materials. Meteorological parameters affecting dispersion of air pollutants. Various equipments used for control of air pollution.
- Introduction to vehicular pollution.

Text Books :

1. B.C.Punmia," Waste Water Engineering" - Laxmi Publication S.K.Garg, "Environmental Engineering" -Vol II Standard Publication

Reference Books :

2. G.S.Birdie, "Water Supply & Sanitary Engineering"
3. M.J.Macghee, "Water Supply & Sewage – McGraw Hill Publication
4. M.N.Rao&HV.N.Rao, "Air 'Pollution" McGraw Hilt publicatin

Semester V, B.E. (Civil Engineering)

Course Code: CET303 **Course: Surveying – II**

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

Course Outcomes :

1. The students would be able to do temporary and permanent adjustments.
2. The students would be able to measure distances and angles.
3. The students would be able to orient and draw the various maps.
4. The students would be able to calculate areas and volumes of the earth work.
5. The student would be able to undertakevarious civil engineering surveys and convert the data into usable forms.

UNIT-I (08)

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

UNIT-II (08)

Horizontal Curves :

Simple circular curve: Elements of simple circular curve, designation of curve, setting out of simple 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 (08)

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 (08)

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 (08)

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 (08)

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. Kanerkar 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.
5. Surveying Vol.2 by S.K. Duggal, McGraw Hill Publication.

Reference Books :

1. Elements of Photogrammetry by Paul R. Wolf. McGraw Hill Publication,
2. Remote sensing in Civil Engineering by K.Ghosh, Narosa Publishing House.
3. Remote sensing in Civil Engineering by J.M. Kennie and M.C. Matthews.
4. The GIS book, 5th Edition, George B Korte PE onward Press.

Semester V, B.E. (Civil Engineering)

Course Code: CEP303 **Course: Surveying – II**

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

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 survey project and prepare maps, cross-section, contour maps, L-stations.

Practicals (Any Six)

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 tacheometric 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.

II Survey camp: On any of following for minimum three days

- Road Project
- Irrigation Project
- Water Supply Project

Semester V, B.E. (Civil Engineering)

Course Code: CET304 **Course: Transportation Engineering - I**

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

Course Outcomes :

Upon completion of this couse, the students :

1. Will be conversant with various terminologies of Highway Engineering
2. Will have complete knowledge of Engineering Surveys, Planning Surveys and different objectives of Planning, so that he should be able to plan a new highway.
3. Will be able to design various geometric features of highways.
4. Will have general ideas about various design and construction practices in highway.
5. Will be conversant with various terminologies of Traffic Engineering.
6. Will be well aware of various safety features of highways.

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: 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 discharge, 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

Semester V, B.E. (Civil Engineering)

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

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

Course Outcomes :

Upon completion of this couse, 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.

Practical :

Every student must carry minimum of 10 (Ten) experiments from 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

Semester V, B.E. (Civil Engineering)

Course Code: CET305 **Course: Building Design &Drawing**

L:1Hr., T:1Hrs., P:0 Hrs., Per week **Total Credits : 03**

Course Outcomes (Theory)

Upon completion of this couse, the students :

1. Will have a basic knowledge about the planning of the residential as well as public building.
2. Will have knowledge of preparation of the working drawing.
3. Will be able to prepare of submission drawing according to the local bylaws.
4. Will be able to draw the percpective 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, Combined First angle and Third angle method of projection, abbreviations and conventional representations as per IS: 962, 1967. Free hand dimensioned sketches of various building elements and its importance in Civil Engineering.

Unit II :

Study of building site requirements, requirements of owner, local bye-laws and Principals of planning. Planning of residential and public buildings as per recommendation of CBRI, Roorki.

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 load bearing structure with pitch roof to scale with location plan, site plan and block plan.

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 projections etc.

Text Books :

1. Building Drawing by Shah, Kale &Patki, TMH publication, Fourth Edition.
2. Building Planning & Drawing by Dr. N.Kumara Swamy,A. Kameswara Rao, 7th edition, Charotar Publishing House.

Reference books :

1. A course in Civil Engineering Drawing, Sikka V.B, S.K. Kataria& Sons publication, 1997.

IS: 1256-1958 (IS Code of building byelaws), Indian Standard

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Semester V, B.E. (Civil Engineering)

Course Code: CEP305 **Course: Building Design &Drawing (P)**

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

Course Outcomes (Practicals)

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 studnets will be able to plan residential and public building.

Assignment no.1

Computer aided free hand self explanatory dimensioned sketches of various building elements.

Assignment no.2

Development of plans for residential building.

Assignment no. 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.

Assignment no. 4

Developing submission drawings for double storey residential building frame structure with flat roof to scale with location plan, site plan and block plan.

Assignment no. 5

Graph paper design (line plans) based on various requirements for Hospital / Hostel buildings.

Assignment no. 6

Graph paper design (line plans) based on various requirements for shopping complex / primary school building.

Assignment no. 7

Developing submission drawings for multi-storey commercial building load bearing structure with pitch roof to scale with location plan, site plan and block plan.

Assignment no. 8

Two point perspective of the single storied Residential building neglecting small building elements. (Pitched roof)

Assignment no. 9

Two point perspective of the single storied Residential building neglecting small building elements. (Flat terraced roof)

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Semester V, B.E. (Civil Engineering)

Course Code: CET306 **Course : Hydrology and Water Resources**

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

Course Outcomes :

1. The students will be able to demonstrate the capability to establish correlation between the various hydrological parameters.
2. The students will have the knowledge of measurements of various parameters and its importance in water resource management.
3. The students will be able to understand the hydrograph theory in the analysis of runoff and determination of design discharge for hydrological projects.
4. The students will be able to apply various statistical methods in hydrological data analysis.
5. The students will be able to apply the knowledge of importance of groundwater recharging and its techniques.

Unit – I :

- **Introduction to Hydrology:** definition importance and its applications in Engineering. Hydrologic cycle, water budget, water resources of India. 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; Depth-Area-Duration Relationship,Frequency of point rainfall. Rainfall data of India.

Unit - II :

- 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 effective rain fall.

Unit - IV :

- **Statistical Methods:** statistics in hydrologic analysis, probability and probability distributions, analysis of time series, Gumbel's method.
- **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: 1/223-1985).
- Risk reliability, safety factor and safety margin for flood, introduction to flood routing, flood forecasting and fold control, National discharge water policy.

Unit - V :

- **Groundwater :** Introduction, occurrence and zones of ground water, aquifer, aquiclude, aquitard and aquifuge. Confined and unconfined aquifer, aquifer properties, 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.
- **Project planning for water resources:** multipurpose projects, inter basin water transfer and inter state river dispute. Water resource planning through watershed management.

Text Books :

- Hydrology and Water Resource Engineering by Reddy
- Water power engineering by B.C. Punmia (Laxmi Publication.)

ReferenceBooks :

- Hydrology and Water Resource Engineering by S. K. Garg (Khanna publication)
- Hydrology and Water Resource Engineering by Subramanium (Tata McGraw Hill publication)
- Water Resources systems by P R Bhave&Narosa Publishing house, New Delhi.

Semester V, B.E. (Civil Engineering)

Course Code: CEP307 **Course: Technical Writing**

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

Course Outcomes :

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

1. Comprehend the technical writing/documents.
2. Explore different format features
3. Analyze the document / report clearly, Concisely and logically.
4. Communicate effectively in an attempt to extract data required for writing the specific document.

Syllabus

1. Reading strategies: Practice in various reading techniques, skimming, scanning, eye reading etc. Active and passive reading and interpreting charts and diagrams – Need and role of reading in technical/Industrial organization.

2. Written communication: Introduction to technical writing – Discourse writing, Definition, Description. Instruction – summary writing – sales letters.

3. Business communication: Business correspondence – format - , tone and massage of business letters – prospective/ point of view in writing – sales letters.

4**. Listening & language Developments:** Barriers to listening : Physical and psychological – steps to overcome them – listening with a purpose – active listening and anticipating the speaker – precise in note – taking- steps to improve speaker's contribution.

5. Successful speaking techniques: How to improve self – expression – Need for clear thinking – the speech process _ Fluency and Accuracy in Speech – developing persuasive speaking skills –goal oriented group

SIXTH SEMESTER

Semester VI, B.E. (Civil Engineering)

Course Code: CET308 **Course: Estimating & Costing**

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

Course Outcomes :

1. The students should be able to read the detailed drawings and then imagine the appropriate items involved in proposed work.
2. The students should be able to prepare preliminary estimate for administrative approval and to check financial feasibility of project.
3. The students should be able to understand the required quality of materials and workmanship, accordingly draft the detailed specifications of involved items in work.
4. The students should be able to analyze unit rate of items with the current local market rates of materials and labours, and work out the unit costs of items involved in the work.
5. The students should be able to apply the unit rates of items and net quantities to prepare the abstract sheet of estimate.
6. The students should be able to prepare contract documents, float tender and select proper agency to actual execution of work. And students should be able to supervise the construction site, prepare running bills and final bill and maintain the accounts of works.

Unit I :

- Purpose of estimate, Mode and Unit of measurement of various items, work charge establishment, contingencies, technical sanction, administrative approval, price escalation., current schedule of rates
- Types of estimate, Approximate estimate its use and methods , methods of details estimate, estimatation of earthwork of road & canal, Mass haul curve and its importance.
- Detailed estimation of reinforcement in RCC members, bar bending schedule.

Unit II :

- Detailed estimation of building 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 tenders, acceptance and rejection of tender, tender documents, unbalanced tender, pre qualification& post qualification of contractor, revocation of tender, liquidated damages, Arbitration. Drafting of short tender notice.

UNIT IV

- **Specifications :** Definition, objectives, principles of writing specification ,sources of information, types of specifications, Developing and drafting details specifications of important items of work in buildings and roads.
- **Rate Analysis :** Purpose, Factors affecting, Task works per day , Rate analysis of important items of work.

UNIT V

- Valuation : Purpose, Factor affecting, Terminology used, cost price & value, Types of property freehold & lease hold , Methods of Valuations.
- 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:

- Estimating, Costing, Specification and Valuations in Civil Engineering by M Chakraborti, 12th edition.
- Estimating and Costing by B. N. Dutta, S. Dutta& company, 22nd edition reprint.

Reference Books:

- Contracts and Estimates by B.S. Patil
- Valuation of Real Properties by Rangwala
- Valuation by Roshan Namavati
- Estimating Costing and Accounts (civil) by D. D. Kohli, S Chand and company ltd. 10th edition.

Semester VI, B.E. (Civil Engineering)

Course Code: CEP308 **Course: Estimating & Costing**

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

Course Outcomes

1. The students should be able prepare preliminary and detailed estimate of proposed works.
2. The students should be able to analyse the unit rates of items using current market rates and draft the specification of items on basis of expected quality of material and workmanship.
3. The students should be able to determine the present value of structures
4. The students should be able to analyse the standard rent of property.
5. The students should be able to use the estimating & costing software for the analysis of measurements and costing of civil works.

PRACTICAL: Minimum 10 practical assignments based on following topics

- Preliminary estimate of building using plinth area method
- Detailed estimate of two room load bearing structure using long wall – short wall method
- Detailed estimate of residential/ public building with RCC framed structure using long wall – short wall method and check by center line method
- Detailed calculation of steel and preparation of bar bending schedule for important RCC member of structure
- Earthwork of hill road for 1 km length
- Draft a detailed specifications for 5 major items of works.
- Analyse the rates for 5 major items of works.
- Fixation of standard rent of building / property from the given data.
- Determination of annual depreciation, total depreciation and book value of property
- Determination of capitalised value of a property.
- Draft a short tender notice for proposed work.
- As per IS 1200 units and mode of measurements of various items of building and road works with current local market rates..

Semester VI, B.E. (Civil Engineering)

Course Code: CET309 **Course: RCC Structure**
L:3Hr., T:1Hrs., P:0 Hrs., Per week **Total Credits : 07**

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.
4. Will be able to understand and analyze the effect of various support conditions on design of structures.
5. Will be able to implement the knowledge in using analysis and design softwares.

Unit- I (06 hrs)

- 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 (06 hrs)

- 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 (06 hrs)

- 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 (08 hrs)

- Design of simply supported, single span one way slab, cantilever slabs and continuous slab/ beam with IS coefficients.
- Design of rectangular pad / slopped footing for axial load.
- Design of Dog- legged and Open Well Staircases.

Unit- V (06 hrs)

- 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 (08 hrs)

- 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:

- Illustrated Design of RC Buildings by V. L. Shah and S. R. Karve, Standard Publisher
- Reinforced concrete design by S. Sinha
- Design of Prestressed concrete structures by N KrishnaRaju

Reference Books:

- Fundamentals of RC Design by M L Gambhir
- Limit State Design of Reinforced concrete by P. C. Varghese, Prentice hall of India Pvt. Ltd., 2007
- RCC Design by Menon&Pillai.
- RCC Design by A.K.Jain

Semester VI, B.E. (Civil Engineering)

Course Code: CEP309	**Course: RCC Structure**
L:0Hr., T:0Hrs., P:2 Hrs., Per week	**Total Credits : 02**

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.

Practical shall consist of minimum Four 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 / slopped footing.
4. Dog- legged and Open Well Staircases

One field visit and its report in the journal.

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Semester VI, B.E. (Civil Engineering)

Course Code: CET310 **Course: Geotechnical Engineering – II**

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

Course Outcomes :

On 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 and their Geotechnical design.
4. Understand various geotechnical designs and select type of shallow foundations.
5. Understand various geotechnical design their stability, and efficiency of deep foundations.
6. Evaluate the various techniques of ground improvement and apply them on field.

Unit- I : GEOTECHNICAL EXPLORATION

Importance and objective of field 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. Principles of design of samplers, collection &shipments of samples, boring and sampling record. Standard penetration test, corrections for N- values &corrections for obtained design soil parameters.

Unit- II : STABILITY OF SLOPES

Causes and types of slope failure, stability analysis of infinite slopes and finite slopes, center of critical slip circle, slices method of homogeneous c- soil 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- 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- IV: GROUND IMPROVEMENT

Methodsof soil stabilization use of admixtures (lime, cement, fly ash) in 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.Advance techniques such as geophmes, geocells, geotextile application.Sand drain installation, pre- loading. Stone column vibrofloatation techniques.

Unit- V: SHALLOW FOUNDATION

Bearing capacity of soil: Terzaghis theory, its validity and limitation, bearing capacity factor, types of shear failure in foundation soil, effect of water table on bearing capacity, correction factor for shape and depth of footing. Bearing capacity estimation from N-value, factor affecting bearing capacity, presumptive bearing capacity.

Settlement of shallow foundation: causes of settlement, 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- VI: PILE FOUNDATION

Classification of piles, constructional features of cast- in – situ &pre cast concrete piles. Pile driving methods, effect of pile driving on ground. Load transfer mechanism of axially loaded piles. Pile capacity by static formula &dynamic formulae, pile load test and interpretation of data, ground action in piles, spacing of piles in group by simple approach, negative skin friction and its effect on pile capacity, general feature of under reamed piles.

Text Books:

1. Basic and Applied soil Mechanics by GopalRanjan&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. Soil Mechanics and Foundation Engineering by K.R. Arora, Standard publisher and distributor, 1989 & later.
2. Soil Mechanics and Foundation Engineering by B.C. Punmia, Laxmi publication Pvt. Ltd. New Delhi and distributor, 1994 & later.
3. Ground Improvement: Purushothama Raj; Tata Mcgraw Hill Publishing Co.

Semester VI, B.E. (Civil Engineering)

Course Code: CET311	**Course: Fluid Mechanics – II**
L:3Hr., T:1Hrs., P:0 Hrs., Per week	**Total Credits : 07**

Course Outcomes :

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

1. Understand and apply the basic concept of laminar and turbulent flow of fluid, boundary layer and its types in solving the practical problems.
2. Understand the hydraulics of flow in smooth and rough pipe, concept of frictional resistance to flow, flow through series, parallel &branched pipes flow looped network analysis using Hardy-Cross method and water hammer pressure due to sudden and gradual closure of valve.
3. Apply basics to analyze, critical flow, uniform flow, specific energy in open channel flow.
4. Understand and apply the basics of gradually varied flow, rapidly varied flow in open channels.
5. Know the constructional details, heads and working principles of pumps and turbines.

Unit I :

- LAMINAR FLOW : In Circular pipes, Velocity and shear stress distribution; Hagen-Poiseuille equation., concept of drag &lift.
- BOUNDARY LAYER THEORY: Thickness of boundry layer ,Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer;

Unit II :

- FLOW THROUGH PIPES: Hydraulics of flow such as hydraulically smooth and rough pipe, frictional resistance to flow, Darcy-weisbach & Hazen –william equation, Hydraulic gradient and energy gradient. pipes in series, parallel, branched pipes, looped network- introduction, analysis using Hardy-Cross method, Water hammer pressure.

Unit III : FLOW THROUGH OPEN CHANNEL:

- GENERAL: Types of channel, geometrical properties, types of flow in open channel, most economical channel section.
- UNIFORM FLOW: Basics and computations
- CRITICAL FLOW: Basics and computations

Unit IV :

Applications of specific energy concept, Gradual transition of channels, humps, width restrictions.

Unit V :

- **GRADUALLY VARIED FLOW:** Equation of gradually varied flow, Classification and characteristics of surface profiles, its computations.

  ce profiles, its computations.

- **RAPIDLY VARIED FLOW:** Basics and analysis of hydraulic jump.

Unit VI : FLUID MACHINERY:

TURBINES –Basics components, heads, efficiencies, classification.

- **CENTRIFUGAL PUMP:** Basics, operating characteristics, pump head curve, pumps in series & parallel, common problems and remedies

Text Books:

- Fluid Mechanics & Hydraulic Mechanics by R.K. Bansal; Laxmi Publication (P) Ltd, Delhi.
- Hydraulic & Fluid Mechanics- Dr Modi & Dr Seth
- Flow through open channel by K. Subramanya

Reference Books:

- Fluid Mechanics through problems- Garde
- Foundation of Fluid Mechanics- Yuan
- Flow through open channel- K.G.Rangaraju.
- Fluid Mechanics by H. Chaudhary.
- Fluid Mechanics Streeter and Wylie.

Semester VI, B.E. (Civil Engineering)

Course Code: CEP311 **Course: Fluid Mechanics – II**

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

Course Outcomes :

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

1. Handle & operate the equipment according to its working principles.
2. Plan and conduct the experiments in accordance with the aims.
3. Determine the hydraulic coefficients of discharge measuring equipments, and also hydraulic performance of machines and equipments.
4. Analyse the experimental and theoretical observations.
5. Analyse branched as well as looped water distribution networks.

Any eight experiments based on the following

Practical :

1. Study of flow around immersed bodies.
2. Determination of Darcy-Weisbach friction factor for given pipes.
3. Determination of Manning's &Chezy's constant for open channel.
4. Developing specific energy diagram for a rectangular channel.
5. Study of GVF profiles.
6. Determination of efficiency of Pelton Wheel and Fransi's Turbine.
7. Determination of spillway constant.
8. Analysis of water distribution system.
9. Other experiments based on the syllabus.

Semester VI, B.E. (Civil Engineering)

Course Code: CEP312 **Course: Computer Application in Civil Engineering**

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

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.

Semester VI, B.E. (Civil Engineering)

Course Code: CEP313 **Course: Site Visit**

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

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.

References :

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, Macraw Hill, 1987.

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OPEN ELECTIVE

Course Code: CET314-1 **Course: Environmental Pollution**

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

Course Outcomes

1. The students would be able to briefly understand the causes, spread and effects of air pollution .
2. The students would understand, in short, air sampling methods and air pollution control.
3. The students would have brief knowledge of vehicular and noise pollution and its control.
4. The students would have broad idea regarding solid waste management e.g. sources, quantity, collection and transportation.
5. The students would have a brief knowledge of solid waste processing, treatment and disposal including that of e-wastes.
6. The students would have knowledge of characteristics of water, drinking water standards and necessity of treatment.
7. The students would be able to understand the various unit operations and unit processes in water treatment and flow sheet of conventional municipal water treatment plant.
8. The students would be able to understand the various characteristics of wastewater and its significance in sewerage project.
9. The students would briefly know the methods of treatment and disposal of wastewater.

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, pollution 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.
- 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 :

- Water treatment: Types of water demand, population forecasting, sources of water, characteristics of water and its effects, various water borne diseases, water quality standard, necessity of water treatment, conventional water treatment plant. Function, significance and working of various units of water treatment plant.

Unit-VI :

- Wastewater treatment & disposal: Characteristics of wastewater, disposal standard, Conventional wastewater treatment plant and function, significance and working of various units of conventional wastewater treatment plant. Various secondary treatment units used in industrial wastewater treatment. Significance, working and design of septic tank. Disposal of wastewater by the methods of dilution.

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 waster management in developing countries by A. D. Shinde and B. B. Sundersan (INSDOC, New Delhi)

OPEN ELECTIVE

Course Code: CET314-2 **Course: :Green building and Vastu Concepts**

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

Course Outcomes :

1. The students should be able to describe the importance and necessity of green building.
2. The students should be able to assess a building on the norms available from green building.
3. The students should be able to define parameters for design of green building.
4. The students should be able to design a new building as green building.
5. The students should be able to suggest various technologies to improve energy efficiency of green building.
6. The students should be able to assess environmental impact of building.
7. The 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.

Unit-II :

- Classification of green building, Assessment methods, Global assessment and certification, BREEAM (Building Research Establishment's Environmental Assessment Method) , GB Tool, LEED (Leadership in Energy and Environmental Design), CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) , Green Globes, Local assessment, LEED India, GRIHA (Green Rating for Integrated Habitat Assessment) .

Unit-III :

- Development of energy efficient building, Introduction, Concept, Advantages, Design parameters, Sustainable Sites, Water Efficiency,

Unit-IV :

- Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, An additional category Innovation & Design criteria.

Unit-V :

- Energy Conservation Building Code, Study of existing green buildings.

Unit-VI :

- Vastushastra, Global and local approaches, Concept, Application.

Reference Books :

- H, Ravindranath, K UshaRao, B Nataraja n, P Monga, Renewable Energy and Environment -A Policy Analysis for India,Tata McGraw Hill, 2000.
- M Fowler, Energy and the Environment, 2nd Ed, McGraw Hill, New York, 1984

SEVENTH SEMESTER

Semester VII, B.E. (Civil Engineering)

Course Code–CET401 **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 , staircases, retaining walls.
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, retaining walls.
3. Will demonstrate the ability to understand the behavior and modes of failure, and to analyze and design reinforced concrete two way slab structures.
4. Will demonstrate the ability to relate the knowledge and design skills taught in class to real world problems & implement the technique in designing software.

Unit – I (08hrs)

1. Limit state of collapse in flexure: Analysis and design of doubly reinforced rectangular, T and L section
2. Limit state collapse in Torsion: Concept of interaction of torsion, shear and flexure, analysis and design of rectangular sections for torsion, shear and flexure.
3. Limit state of serviceability: Deflection calculations for beams and one way slabs.

Unit – II (08hrs)

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

Unit – III (08hrs)

1. Analysis and design of columns subjected to biaxial moments, design of long columns
2. Analysis and design of portal frames (single bay single storey), hinged or fixed at base, design of hinge and design of foundation.

Unit – IV (10hrs)

1. Design of isolated footings for uniaxial and biaxial bending for square, rectangular and circular section.
2. Design of combined footing

a) Rectangular footing

b) Strap beam footing

c) Trapezoidal footing

d) Raft footing

Unit – V (06hrs)

1. Design of RCC two way slab with various end conditions using with IS code coeff.
2. Design of RCC cantilever and counter fort retaining wall.

Reference Books :

- Illustrated Design of RC Buildings by V. L. Shah and S. R. Karve, Standard Publisher
- Reinforced concrete design by S. Sinha ,Publisher: Tata McGraw Hill
- Design of Prestressed concrete structures by N KrishnaRaju
- Fundamentals of RC Design by M L Gambhir
- Limit State Design of Reinforced concrete by P. C. Varghese, Prentice hall of India Pvt. Ltd., 2007
- RCC Design by Menon&Pillai., Tata McGraw Hill
- Limit state Design of reinforced conc. (As per IS 456:2000), Dr. BC Punmia, A.K. Jain, Laxmi publications.

Semester VII, B.E. (Civil Engineering)

Course Code –CEP401 **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. Use techniques and computer software in the analysis of reinforced concrete structural systems.
4. Apply principles, procedure and code requirement to analysis and design of RCC structures through design project.
5. Work in groups in the solution of design problems.

Practicals :

Practical work shall consist of

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

a) Two way slab with various end conditions

b) Cantilever/counterfort retaining wall

c) Combined footing

d) Portal frame

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

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Semester VII, B.E. (Civil Engineering)

Course Code –CET402 **Course:Irrigation 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. Have an idea regarding necessity and scope of irrigation engineering, the present scenario in India and in Maharashtra.
2. Apply knowledge of mathematics through differential equations, calculus based physics, chemistry, biology, earth science, strength of materials and fluid mechanics for related problems in Irrigation Engineering.
3. Know about the storage and diversion schemes, related components and their functions.
4. Check stability of Gravity dams and Earth dams and work out capacity and life of reservoirs. They will also be able to design lined and unlined canals and detail out the cross sections.
5. Use the techniques, skills, and modern engineering tools necessary for irrigation engineering practice.
6. Know about soil erosion problems and remedial measures .They will also know about water conservation, its necessity and water management practices.

Unit – I :

GENERAL : Necessity and importance of Irrigation Engineering; Benefits & ill effects of Irrigation; Classification of Irrigation; 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.

Reference Books :

- Irrigation Engineering and Hydraulic Structures by Santosh Kumar Garg, Khanna Publishers.
- Irrigation Engineering and water Power Engineering, B. C. Punmia, Laxmi Publications.
- Irrigation Engineering and Hydraulic Structures by K. R. Arora, Standard Publishers.
- Irrigation Engineering and Hydraulic Structures by R. K. Sharma, S.Chand Publications.
- Irrigation and Water Resources Engineering by G. L. Asawa, New Age International Publishers.
- Irrigation Engineering by P. N. Modi, Standard Publishers.

Semester VII, B.E. (Civil Engineering)

Course Code –CEP402 **Course :Irrigation Engineering**

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

Course Outcomes :

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

1. Check stability of a given section of gravity dam.
2. Check stability of a given section of earth dam.
3. Design lined and unlined canals.
4. Determine reservoir capacity and life of reservoir

Practical's :

- Reservoir Planning – Capacity of reservoir.
- Life of Reservoir.
- Gravity Dam – Stability checks.
- Earthen Dam – Phreatic Line, Stability checks.
- Design of canals (Lined and Unlined).
- Design of Lift Irrigation Scheme.

Semester VII, B.E. (Civil Engineering)

Course Code –CET 403 **Courses: Contract, Accounts & Work Management**

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

Outcomes :

1. The student will be able to register them / their firm with various government agencies providing civil engineering works.
2. Students will have insight to the various business laws and different types of taxation which are applicable to start a civil engineering project.
3. Students will be able to make financial analysis of a project taking into account taxation, interest and administrative expenses.

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 and sales.

Unit -IV :

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

Unit -V :

Taxation : VAT, Sales Tax, Work tax, Professional Tax, Turn over tax, Service tax, Income tax

Unit -VI :

Types of business organization- proprietorship, partnership, Co- operative, Private company, Public company. Project financing – short , medium and long term.

Books :

Accounting Principles ; R N Anthony

Cost and Management accountancy : S P Jain

Financial Management : M Y Khan

Business Laws : P R Chadha

Taxman's student guide to company law : A K Mujumdar

Taxman's student guide to Financial Management : Ravi Kishore

Semester VII, B.E. (Civil Engineering)

Course Code –CET 404-1 **Course: Elective I - Advance Construction Materials**

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

Outcome :

1. The students will be able to identify and classify advance construction materials.
2. The students will be able to decide the material according to need and economics of project.
3. The students will be able to understand the effect of different material on performance and economics of construction project.
4. The students will be able to understand behavior and utility of various materials in order to improve quality of projects.
5. The students will be able to explore areas of research in construction material and quality improvement.

Syllabus

Unit – I :

Classifications of Construction Materials.Consideration of physical, Mechanical, thermo-physical Properties, selection criteria for construction materials.

Unit -II :

Ceramic Materials : Classification, Refractories, glass, glass wool, mechanical, thermal and electrical properties, fire resistance materials, Uses and application.

Unit- III :

Polymeric Materials : Rubber and plastics, properties, effect of temperature on mechanical properties. Uses and application. Polymers in Civil Engineering Polymers, fibres and composites, Fibre reinforced plastic in sandwich Panels,. Architectural use and aesthetics of composites.

Unit -IV :

Thermal insulation and acoustic absorption materials, Water proofing materials and compounds, Flooring materials, Repair materials.

Hybrid systems in concrete, smart concrete.

Unit - V :

Use of waste products and industrial by-products: Fly ash, micro,silica, GGBS and other mineral products, Geo textiles and geo synthetics – applications in Civil Engineering. Concrete under special environment, high density concrete, concrete for nuclear reactors.

Unit - VI :

Materials for repair and retrofitting, construction chemicals

Reference Books :

1. Engineering Materials, Rangawala S.C., Chortor Publications
2. Building Materials, S.K. Duggal, New Age International Publications
3. Building Materials Technology Structural Performance & Environmental Impact, Bruntley L.R, McGraw Hill Inc
4. Construction Technology, Vol I - IV, R Chudley, Longman Group Construction Ltd.

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Semester VII, B.E. (Civil Engineering)

Course Code –CET404-2	**Course: Elective - I Maintenance & Rehabilitation of Civil Engineering Structures**
L : 3Hrs, T : 1Hrs, P : 0 Hrs per week	**Total credit : 7**

Course Outcome :

1. A student is able to inspect, identify and diagnose distresses on primary level.
2. Student can develop a maintenance plan for a structure or utility
3. Student is able to correlate preventive maintenance to repair methods
4. Student is able to suggest a repair plan for structure.
5. It enables students to quantify effect of maintenance job in terms of expenses
6. It enhances quality of research in upcoming maintenance methods.
7. It makes student aware about the relation of maintenance work and quality control.

Unit – I :

1. Introduction : Deterioration of structure, 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, measure of maintenance.

2. Classification of Maintenance Work: servicing, rectification, replacement planned, unplanned, preventive, corrective, predictable and avoidable maintenance work. Renovation and rehabilitation.

3. Common Maintenance Problems: Relating 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 :

1. 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.

2. Inspection, identification and diagnosis of common defects and failure with possible cause in buildings, roads, bridges, railway tracks, canal and CD work, tunnels and special structures like service reservoirs, water supply, sewage, storm water drains.

Unit – III :

1. Preventive Maintenance : General, site selection, choice of structural system and material, specification and detailing. Buildings special attention to foundations, wells, roof, terrace, floor, doors and windows, plinth, compound walls, expansion joints, stair cases to improve maintainability. Pumping and sanitary work. Termite control. External finishes. Roads stabilization techniques, compaction and drainage, slope protection, joints in C.C. pavements, Routine and service maintenance. Bridges and CD works, Repair, strengthening and rehabilitation. Service life and expected load caring capacity. Service and stability requirements. Future service requirements, loads, fatigue, creep.

Unit – IV :

1. Material and Techniques for Maintenance : Materials for repair like cement, cement grouts, epoxy grouts, mortars and coatings, polymer concrete composites, sealants, membrane overlay, fiber reinforced concrete, resin based compounds, emulsion and paints, geotextiles. Techniques like stiffening, lining, grouting, protection system, prestressing, post-tensioning and base isolation technology. Temporary support system for structures like timbering, shoring etc.

2. Economics of Maintenance : The burdon 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.

Unit – V :

1. 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. Inspection cycle and condition survey. Ingestion for assessing condition of structures including nondestructive evaluation techniques like proof load test, photogrammetric analysis, asets and opt electric motion analysis, bovoscopes, fiber optic probes, chain dragging, acoustic emulsion and ultrasonic techniques, infrared thermography, high speed non-contact sensors, sonar and sound penetrating radar techniques. Reliability ratings. Maintenance cost records. Maintenance manual, their functions. Contents and types. Difficulties in the way of planned maintenance.

Unit – VI :

1. Maintenance Oriented Designs : Design and its relation to maintenance. Relationship between initial, maintenance and running costs. Cost appraisal techniques. Consideration of maintenance at design stage. Design needs. Importance of feedback. Feedback systems. Information gathering, the design data communication. Interaction amongst designers; contractors. Uses maintenance and. researchers.

Maintainability, role of design professional.

2. 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.

3. Research into Maintenance : Importance of research. Areas of research including materials, techniques. Field equipment and tools for investigation, repairs and monitoring non-destructive evaluation techniques.

Reference books :

1. Building maintenance by Ivor H. Seeley; The Macmillan Press.Ltd.
2. Facilities Maintenance and, Repair of damaged structures by Karper. A. Compilation oftechnical papers, issued by Maharashtra, - India Chapter of American Concrete Institute.
3. Building, Maintenance Economics and Management. Edited by ,Alan Speeding; E. &,F. N; Spon. London.

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Semester VII, 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 :

On completion of the course, the students will :

1. Have an idea of analysing how unsteady problems in water resources sector.
2. Demonstrate ability to apply knowledge of mathematics to real life problem in an integrated way (kinetics and kinematics), and Fluid Mechanics I and F.M.II.
3. Be able to apply specific energy and specific force concepts in open channel hydraulics.
4. Show ability to analyze and identify GVF profiles in practical situations and determine length of the profiles and understand the importance of computation of GVF in solving techno - social problems in water resources projects.
5. Demonstrate ability to use appropriate water hammer theories in the given practical situations and suggest the ways and means to deal with the related problems.
6. Demonstrate ability to analyze flow in Surge Tank and design it.

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 of water hammer and computation of water hammer pressures.
- Elastic water column theory and computation of water hammer pressure Allievi'smethod

Unit - IV :

- Water hammer pressures in pumping systems.

- Methods and Characteristics.

Unit - V

- Computation of water hammer pressure in branched pipe system and in surge tank system.
- Various devices used for protection from water hammer pressures
- Water hammer pressure reduction and protection of system.

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. Fluid Mechanics through problems by R. J. Garde, Second reprint. Published by Wiley Eastern Limited, New Delhi.
2. Theory and Application of fluid mechanics by K. Subramanya. Published by Tata McGraw Hill Publishing Company Limited, New Delhi.
3. Fluid Mechanics and Hydraulic machines by R. K. Rajput 2nd edition, reprint 2005, by S. Chand & Company Ltd., New Delhi.

ReferenceBooks:

1. Flow through open channel by K. G. RangaRaju
2. Open channel hydraulics by VenTe Chow
3. Flow in open channels by K. Subramanya
4. Fluid Mechanics by Streeter & Wylie
5. Fluid Mechanics for engineering by P. N. Chatterjee.

Semester VII, B.E. (Civil Engineering)

Course Code - CET 404 – 4 **Course: Elective I - Advance 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. Improvising techniques, skills, and modern engineering tools necessary for understanding in geotechnical engineering practice.
3. Know the swelling and shrinkage characteristics of soil.
4. Impart knowledge in modern instrumentation methods and also thermal, electromagnetic identification techniques of soil

Unit- I :

Overview of Basic Geotechnical Engg: Broad perspective of geotechnical engineering, Rational solution to problems associated with soil, & rock soil as engineering material, Soil formation & its geomorphology. Soil properties, granulomettry, consistency, relative density, permeability, shear strength, compressibility. IS soil classification, suitability of various soil groups, field identification.

Unit- II :

Physico - Chemical properties of clays: Origin and classification of clay minerals, lattice structures and characteristics of kaolinite, illite and montmorillonite, isomorphic substitution, specific surface, adsorption of ices & dipole water molecules on clay particles, base exchange & its engineering significance, formation & characteristics of flocculated & depressed clay structures, sensitivity, thixotropic, thixotropic fluids, identification of clay minerals by x-ray diffraction and DTA methods.

Unit - III :

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 - IV :

Seepage & Dewatering: Introduction Seepage, Two dimensional flow, Laplace equation, 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 - V :

Consolidation: 2-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 - VI :

Shear Strength: Concepts of effective stress in soil, its computation under various conditions, effective stress in partly saturated soil. Stress states at a point under applied stress, limit equilibrium concept in geomechanics, principal stresses at failure in C- f soil, Mohr's stress circles. Mohr Coulomb`s theory, Drainage conditions and field problems, UU, CU, & CD test. Shear strength characteristic of cohesive and cohesionless soil.

Text books :

1. Principles of Soil Mechanics: Scott R. F., Addison-Wesley Publication co. (1963)
2. Basic and Applied soil Mechanics: GopalRanjan& A.S. Rao, New Edge International Ltd., (2004)
3. Geotechnical Engineering–Principles & Practices: Coduto, D.P. Pearson Edn. Asia

Reference books :

1. Soil Mechanics: Jumikis, A.R., D.VanNostrand co., (1965)
2. Soil Mechanics in Theory and Practices: Alam Singh, Asia publisher and distributor,
3. Soil Mechanics and Foundation Engineering: B.C. Punmia, Laxmi Publications
4. Soil Mechanics and Foundation Engineering: A.R. Arora, CBS Publications.

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Semester VII, B.E. (Civil Engineering)

Course Code – CET405 **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.
5. Able to analyze beams ,truss and frames using appropriate software of structural analysis and design.

Unit- I (06 hrs)

1. Kani's method applied to symmetrical and unsymmetrical frames with sway (Upto one bay two storey)

Unit- II (06 hrs)

1. Approximate method structural analysis for multi- storeyed 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 (06 hrs)

1. 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 (06 hrs)

1. 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 (08 hrs)

1. Basic concept of Degree of Kinematic Indeterminacy. Direct stiffness method as applied to continuous beams and portal frames.
2. 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 degree of freedom four.

Unit- VI (08 hrs)

1. 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.
2. 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 degree of freedom four. Frames with inclined legs.

   Introduction to Finite Element Method, types of elements.

Reference 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 Structures : Gere and Weaver, CBS Publication House.
4 Matrix Analysis of Structures :Meghre and Deshmukh, Charotar Publication House.
5 Advanced Theory of Structural Analysis by Sinha and Gayen, Dhanpatria R Sons.
6 Advance Structural Analysis- Dr. P. Dayaratnam, Tata McGraw Hill Publishing Co. Ltd.
7 Matrix Analysis of Structural by Robert. E. Sennete Prentice Hall, Englenwoodelift, Newjersy.
8 Structural Analysis-Matrix Approach G.S. Pandit& S.P. Gupta,Tata McGraw Hill Publishing Co. Ltd.

Semester VII, B.E. (Civil Engineering)

Course Code - CEP405 **Course: Structural Analysis- II**

L : 0Hrs, T : 0Hrs, P : 2Hrs 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,truss analysis using SAP software etc.

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Semester VII, B.E. (Civil Engineering)

Course Code – CEP406 **Course : Project& Seminar**

L : 0Hrs, T :0Hrs, P : 2 Hrs Per Week **Total Credit : 4**

Course Outcomes :

1. Graduates with a strong foundation of mathematical, scientific and latest technical knowledge and are equipped with problem solving, teamwork, leadership and communication skills that will serve them throughout their careers.
2. They will be conversant with the various elements of research..
3. They will be exposed to how to make presentations.
4. Students gain knowledge about the literature, new technologies/various software's/quality control, testing etc. used in the field project.

   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 /seminars on the work done during the semester. In addition student will deliver one more seminar on the topic finalized by him with consent of his guide.

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EIGHTH SEMESTER

Course Code - CET 407 **Course :Transportation Engineering – II**

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

Course Outcomes :

On completion of this course, the students :

1. Will develop ability to design railways, airports and tunnels.
2. Will develop ability to construct railways, airports and tunnels.
3. Will be able to understand the impact of environment and social issues in design and construction of railways, airports and 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, Gauge, Gradients speed, super elevation cant deficiency Negative super elevation, curves, length of transition curves, grade compensations. Points of crossings : Left and right hand turnout, design calculations for turnout & Crossover, railway track functions. Station and Yards: Types, functions facilities & equipment.

Unit - III :

Railway track construction, inspection & modem, techniques, of maintenance. Push through Technique, Suburban Railway in Metro cities.

Unit – IV :

Airport Engineering : Aircraft characteristics, Airport site Selection. Modem 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 Mechanics, 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 Book :

1. Airport Engineering : G.Venkatappa Rao, Tata Mc.Graw-Hill Publishing
2. Planning and Design of Airports : Robert Herorjeff, Mc.Graw-Hill Publishing
3. Railway Tracks Engineering : J.S.Mundrey, Tata Mc.Graw-Hill Publishing
4. Introduction to Tunnel Construction : David Chapman, Nicole Metje, Alfred Stark, Span Press, New York.

Semester VIII, 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 :

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

a. Exhibit knowledge of construction project management and engineering economy.

b. Plan, organize, schedule, monitor and control a construction project.

c. Plan and monitor inventory, quality and safety control process used over construction site.

d. Execute construction activities of all genres.

e. Use modern engineering methods and analysis using project management software and techniques.

f. Understand professional and ethical responsibility of a construction project manager.

g. Distinguish between the ideal and current construction practices and implementation of modern methods.

Unit - I :

Construction management :

Significance, objective, function, Role of construction managerRegulations 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 proposalComponents of planning, Objectives of planning, factors effecting planning, Organizational setup, Introduction to Project management software , Project appraisal techniques, Capital budgeting, Benefit cost ration calculation, Appraisal techniques, IRR, NPV method, 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.Qualitycontrol:Principles, Measurements and achievements.Safetymanagement: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.ConstructionEquipments:Excavators, Dozers, Hoisting, Hauling equipments 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. Construction Planning, equipment and Method :Peurifoy, McGraw Hill Publication.
2. PERT and CPM: L.Srinath, EWP Publications
3. Construction Planning and management : U K Shrivastava, Galgotia Publications

Reference Books:

1. Construction management and planning : Sengupta and Guha, McGraw Hill Publication
2. Construction Equipment and its management : S C Sharma, Khanna Publishers, Delhi.

Semester VIII, 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 :

On completion of the course, the students will :

1. Understand the importance of water power and hydraulic structures related to water power engineering
2. Demonstrate the ability to apply knowledge of mathematics, statistics, fluid mechanics, in design of penstocks, surge tanks and intakes
3. Understand the design of hydro power plant
4. Be able to understand the economic issues related to water power.

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-of-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 each above.

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; choices; approximate costs.

Unit - VI :

Power houses :

types; general layouts and approximate dimensions.

Non-conventional sources of energy: tidal power; wind power; geothermal power; solar power; elementary principles & description; application of power in drilling & blasting of rocks.

Recommended Books :

Deshmukh M.M., Water power engineering

Semester VIII, B.E. (Civil Engineering)

Course Code - CET 409 – 2	**Course :Elective II - Earth and Earth Retaining Srtuctures**
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'sgraphical constructions for active and passive pressure & Effects of wall movement,wall friction, type if slip surface, wall angle, backfill slope angle, surcharge & line loads on lateral earth pressure. Direction & point of earth force application. (8)

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, Designing of Micropiles.(5)

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 cohesionlesss and cohesive soils, approximate analysis, Analysis for anchored sheet pile walls with free end & fixed end support condition. Dead man and anchors: location and design principles. (8)

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. (8)

Unit-V :

Stability Of Slopes :

Friction circle methods, factoid 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 -------- (6)

Unit-VI :

Comfferdams :

Types, suitability, stability analysis of cellular and diaphragm type cofferdams, TVA method, interlocked stresses. ----- (4)

Braced Cuts :

Sheeting and bracing systems in shallow and deep vertical cuts in different t types of soils. Failure modes, lateral pressure distribution on sheeting, stability of bottom of excavation. (3)

Reference Book :

1. Arora K.R. : Soil Mechanics & Foundation Engineering, CBS Publications.
2. Punmia B. C. : Soil Mechanics & Foundation, Laxmi Publication.
3. GopalRanjan&Rao: Basic &Applied Soil Mechanics, New Age International Publisher, 2005
4. Purshottam Raj : Geotechnical Engineer,McGraw Hill Education,2000
5. VNS Murthy: Soil Mechanics & Foundation Engineering,Vol.-1, Saikripa Technical Consultant, Bangalore 1991.
6. B. M. Das: Principle of Geotechnical Engineering, Cengage Publications.
7. Winterkom H.F &Farg H.: Foundation Engineering Handbook

Semester VIII, 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 :

1. The students will be able to understand the importance of environment in engineering design and affect of various parameters.
2. They will be able to design control methods based on various principles to reduce the affect of air pollution.
3. Student will gain insight to the problem of handling huge amount of solid waste generated in the city every day and will be able to design collection and disposal methods.

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.

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.

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.

Solid waste disposal by incineration: Principles, types, merits and demerits.

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. Shinde and B. B. Sundersan(INSDOC, New Delhi)
4. Air Pollution, NEERI Manual

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Semester VIII, 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 determine the effect of intensity and duration of earthquake on analysis of structures.
2. To determine the forces developed and draw SFD and BMD for structures under loads.
3. To design the components of building.

Unit - I :

Performance of buildings, behaviors of various type of buildings in past, Earthquakes, modes of failures, influence of unsymmetrical& infill walls.

Unit - II :

Frames -shear walled buildings, mathematical modeling of buildings with different structural systems, Analysis of frames shear walled buildings.

Unit - III :

Special aspects in Multi-story buildings, Effect of torsion, flexible first story, P-delta effect &drift limitation.

Unit - IV :

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.IS code provisions.

Unit - V :

Design philosophy of multi-story buildings with Bracings & Infills.

Unit - VI :

Analysis of earthquake forms by using seismic coefficient method.

Reference Books :

1. IS: 1893-2002, 13920-1984, 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 building-L.S. Beedle, CBS Publication & Distributor, Delhi.

Semester VIII, B.E. (Civil Engineering)

Course Code - CET 410 – 1 **Course:Elective III-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. Explain the behaviour and modes of failure of tension members and different connections.
2. Analyze and design tension members, bolted connections, welded connections, compression members and beams.
3. Critique and optimize various steel structures such as industrial buildings, storage structuresand railway bridges.
4. Develop skills to analyze and design astructure while working in a team.

Unit - I :

Introduction: Steel as structural material, Types of loadings on steel structures, Basics of steel design.

Unit - II :

Introduction to plastic analysis and design, introduction to limit state design.

Unit – III :

Design of Simple connections- rivet, bolt, pin, weld.

Unit – IV :

Design of tension members, lug angles, splices, gusset plate

Unit – V :

Design of compression members, axially loaded, built-up columns, lacing, batten.Design of beams.

Unit – VI :

Design of eccentric and moment connections

Reference Books :

1. Englekirk, R.; Steel Structures Controlling BehaviorThrough Design; John Wiley & Sons Inc.; 2003.
2. Duggal, S.K.; Limit State Design of Steel Structures; Tata McGraw Hill Education Private Limited; 2011.
3. Subramanian, N.; Design of Steel Structures; OXFORD University Press; 2008.

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Semester VIII, B.E. (Civil Engineering)

Course Code – CET410-2 **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 understand the basic concepts of reinforced concrete analysis and design.
2. Would be able to understand the behaviour and various modes of failure of reinforced concrete structures such as elevated circular water tanks, foundation etc.
3. Would be able to analyze and design various reinforced concrete structures such as bridge deck slab, building frame.
4. Would be able to understand and analyze the effect of various support conditions on design of structures.

Unit – I :

Design of overhead circular service reservoirs. Analysis of staging by cantilever method. Analysis and design for earthquake as per relevant IS codes. Design of foundation – Annular raft, Full raft.

Unit – II :

Design of highway bridges with IRC loading and equivalent UDL. Slab type Two/Three girder type.

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. Krishna Raju, N.; Advanced Reinforced Concrete Design (IS: 456-2000) 2 Edition; CBS Publisher; 2013.
2. Punmia, B. C. and Jain, Ashok Kumar; Comprehensive RCC Designs; Laxmi publisher; 2005.
3. Shah, H. J.; Reinforced Concrete: Advanced Reinforced Concrete (Volume - II) 6th Edition; Charotar Publishing House; 2011.
4. Varghese, P. C.; Advanced Reinforced Concrete Design; Second Edition; Prentice-Hall of India; 2009.

Semester VIII, B.E. (Civil Engineering)

Course Code - CET 410-3 **Course: Elective III- 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 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 Mc- Graw 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 Mc- GrawHill Publication

Semester VIII, 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 :

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

1. Design pavement of highways and airfields for different loading conditions taking into account material characteristics.
2. Do analysis of rigid and flexible pavements.
3. Conduct testing in field conditions and can apply knowledge to strengthen the pavements along with cost estimates.

UNIT I :

1. **General :** Pavement design factors, components of flexible and rigid pavement and their functions, characteristics of highway and airfield pavement.
2. **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 :

1. **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 :

1. **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 :

2. **Highway Pavement Design:** Flexible: North Dakota cone, Design using the latest IRC code, Triaxial (Kansas), AASHTO method of design
   a) Rigid : Design using the latest IRC code, PCA, AASHTO method of design, design of joints and reinforcements.

UNIT V :

Airfield pavement design:

a) Flexible: FAA, US Corps of engineering, CBR, Mcleod (Canadian)

b) Rigid :FAA, PCA & LCN, definitions of ACN, PCN, LCN. Calculation of LCN value. Ultimate load analysis and yield lines patterns method

UNIT VI :

1. **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.
2. **Strengthening of pavements**: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements.

Recommended 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.

Semester VIII, B.E. (Civil Engineering)

Course Code - CET411- 1 **Course :Elective IV– Applied RemoteSensing and GIS**

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

Course Outcomes :

1. General engineering and science competence Students will have a fundamental knowledge of principles of ariel photography and remote sensing.
2. Students should have ability and knowledge in basic principles of GIS
3. Students should be able to apply knowledge of remote sensing and GIS in various fields of civil engineering, analysis of satellite image, calculation of relief, height etc. of objects from aerial photograph

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 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.

Unit -VI :

Application: Integrated approach of RS and GIS application: Application in Geological Investigations, water resources management, environmental studies ELA based studies, Land use planning, soil studies and transportation planning. Application in civil engineering projects, damns and bridges, site investigations, landslide studies.

Books :

- Remote sensing Geology : Ravi P. Gupta

Remote sensing - Principles and interpretation, floyd F. Fabbins and GIS : A. Reddy

A text book of Remote sensing and Geographical Information Systems, Anji Reddy

Applied remote sencing, C.P.Lo

Semester VIII, B.E. (Civil Engineering)

Course Code –CEP411 -1 **Course: Elective IV–Applied Remote Sensing and GIS**
L : 0Hrs, T : 0Hrs, P : 2 Hrs per week **Total credit : 2**

PRACTICAL

RS Data format and their study: analogue and digital data products

1. Digital image processing: Registration, Enhancements and digital classification.
2. Case studies in water resource (surface, groundwater), environmental geology, engineering projects
3. Calculations on RS data: elevation, spatial attributes
4. GIS, Vector data generation, data attachments and data analysis.

Semester VIII, B.E. (Civil Engineering)

Course Code- CET411-2 **Course: Elective IV–Traffic Engineering**

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

Course Outcome :

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

1. Carry out traffic surveys and can apply various statistical tools to understand traffic data.
2. Apply basic principles to design geometry of roads and traffic controlling devices.
3. Analyze the traffic accidents and will be able to design parking's as per needs.

Unit- I :

1. General: Road, road user &road vehicle characteristics, traffic on Indian roads.
2. 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 :

1. Traffic Events: Statistical method for interpretation, regression, application of binomial normal and Poisson's distributions, discrete and continuous distribution of traffic flow, test of significanceChi-square&'T'test.

Unit-III :

1. 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 :

1. Traffic controlling devices: Traffic signs, road markings, traffic signals, design of signalized intersections& signaling systems, Queingtheory

Unit -V :

1. 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 :

1. 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.

Books :

1. Highway Engineering:(1991)Khanna S.K. and Justo C.E.G.,Nem Chand & Bros.
2. Traffic engineering and transportation planning :(1987)Kadiyali,KhannaPublications.

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.

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Semester VIII, 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.

Practical :

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

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Semester VIII, B.E. (Civil Engineering)

Course Code – CET411-3 **Course : Elective – IV Water and Waste Water Treatment**

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

Course Outcomes :

1. The students will be aware of status of environment globally and locally, they will also know about the problems like water pollution, air pollution, solid wastes etc.
2. The students will be able to design an environmental engineering system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturing, and sustainability; e. g. The students will be able to design various treatment units of water supply and sewerage schemes.
3. The students will be able to design and conduct experiments in environmental engineering, as well as to analyze and interpret data in environmental engineering areas;
4. The students will know regarding composition of typical municipal solid wastes, their sources, collection, treatment and disposal methods.
5. The students will be aware about air pollution sources and ill-effects, measurements and control methods.
6. The students will attain an ability to use the techniques, skills, and modern engineering tools necessary for environmental engineering practice.

Unit - I :

1. Objective of water treatment, unit operation and unit processes, treatment flow site selection for water treatment plant.

   Aeration: objective of aeration, types or aerators, design of cascade aerator, gas transfer, two film theory

   Time of exposure of gravity aerator; driving head, associates carry & rise for spray aerator.

Unit - II :

2. 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.
2. Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling, design of sedimentation tank and clariflocculators

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 chlorinationIron and manganese removal, defluorination recent development in water treatment.

Unit - IV :

Physical and chemical characteristics of waste water, DO, BOD, COD, determination of BOD rate constant Disposal of sewage by dilution and by land disposal, Streator - Phelps's equation.

Unit - V :

1. Treatment Methods: Waste water treatment flow sheet, preliminary, primary and secondary methods of treatment, design of screen. Girt chamber and primary settling tank.

Unit - VI :

Biological unit processes: principle of biological treatment processes, design parameters of activated sludge process, trickling filters, aerated lagoons and stabilization ponds.Sludge treatment, aerobic and anaerobic digestion and sludge drying beds(excluding design). Recent development in waste water treatment.

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 Engineering Vol I & II by B.C. Punmia—Laxmi Publication
5. Wastewater Engineering by Metcalf & Eddy – Tata McGraw Hill
6. Water supply & Sewage by M.S. Macghee, -- Tata McGraw Hill

Semester VIII, B.E. (Civil Engineering)

Course Code – CEP411 - 3 | **Course : Elective IV– Water and Waste Water Treatment**
L : 0Hrs, T : 0Hrs, P : 2 Hrs per week | **Total credit : 2**

PRACTICAL

A) Minimum five experiments

1. Determination of sulphates
2. Determination of chlorides
3. Residual available chlorination and chlorine demand
4. Determination of BOD
5. Determination of COD
6. Jar test
7. Effective size and uniformity coefficient of filter sand
8. Bacteriological test (MPN Test)

B) Design of individual unit of water or waste water treatment

Semester VIII, B.E. (Civil Engineering)

Course Code :CET 411 - 4 **Course: Elective III – Water Transmission and Distribution System**

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. Understand the importance of piped water supply systems and its optimal design
2. Demonstrate the ability to apply knowledge of mathematics, statistics, Fluid Mechanics I and F.M.II in formulating the mathematical equations, models and obtaining the solutions.
3. Demonstrate his understanding about the importance of each component, role played by it and the appropriate sizing of it in water networks.
4. Analyze the limitations of various frictional head loss formulae used in the analysis of water networks.
5. Determine the size of service reservoirs using graphical and analytical methods.
6. Design the pumping main considering continuous and discrete diameter approach.
7. Apply the basic principles of F.M.I and F.M.II to practical water network problems.

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 anf pump co-ordinations, Valves- their types, 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, Introduction of 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, CHR methodology for single source branching networks. Linear programming formulation and solution using simplex method. Introducton of Non- Linear Programming based approaches.

Text books :

Bhave P.R and Gupta (1991), "Analysis of flow in water distribution networks", Technomic Publishing Co. Lancaster, Pennsylvania, USA.

BhaveP.R , " Design of Water Distribution Networks" networks"Technomic Publishing CO. Lancaster, Pennsylvnia,USA.

Reference Books :

Jeppaon R.W.(1977), "Analysis of Flow in Pipe Networks'' Ann Arbor Science. Ann Arbor Michigan, USA.

Walski. T.M.(1984),'' Analysis of flow in water distribution networks''Technomic Publishing CO. Lancaster, Pennsylvnia,USA.

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Semester VIII, B.E. (Civil Engineering)

Course Code -CEP 411-4	**Course : Water Transmission and Distribution System**
L : 0Hrs, T : 0Hrs, P : 2 Hrs per week	**Total credit : 2**

Course Outcomes :

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

1. Perform analysis of water distribution network.
2. Design branched and loops water distribution networks.
3. Analyze actual performance of WDS.
4. Carry out optimal design of WDS.
5. Understand the importance of various design parameters.

Practicals :-Minimum 8 assignments based on following topics

(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.

Semester VIII, B.E. (Civil Engineering)

Course Code - CEP 412 **Course : Project & Seminar**

L : 0Hrs, T : 0Hrs, P : 2 Hrs. per week **Total credit : 12**

Course Outcomes :

On completion of the course, the students will :

1. Demonstrate their strong foundation of mathematical, scientific and latest technical knowledge
2. Demonstrate problem solving, teamwork, leadership and communication skills .
3. Become conversant with the various elements of research.
4. Be able to make presentations.
5. Gain knowledge about the latest additions in literature, new technologies / various software's / quality control,testing etc. used in the field project.

Each group shall deliver seminar/seminars on the work done during the semesters.

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