SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR - 440013

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

PROGRAMME SCHEME & SYLLABI
2019 - 2020

B. E. (CIVIL ENGINEERING)

Published by
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ISO 9001 : 2015 CERTIFIED ORGANISATION

About the Department

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

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

Departmental Vision

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

Department Mission

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

Programme Educational Objectives

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

Program outcomes

Engineering Graduates will be able to :

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

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

Program specific objectives :

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

TEACHING SCHEME FOR FIRST YEAR (SEMESTER I & II) BACHALOR OF ENGG
GROUP 1: SEMESTER-I/ GROUP 2: SEMESTER-II

Sr. No.	Code	Course	Branches	Hours/week L	Hours/week T	Hours/week P	Credits	Maximum Marks: Continual Assessment	Maximum Marks: End Sem Examination	Maximum Marks: Total	ESE Duration (Hours)
1.	PHT151	Mechanics	Civil; Industrial	3	1	0	4	40	60	100	03
	PHT152	Oscillations, waves & Optics	Electrical								
			Mechanical								
	PHT153	Semiconductor Physics	Electronics; EDT; Electronics & Comm								
			Computer Science Engg; Information Tech.								
2.	PHP151	Mechanics Lab	Civil; Industrial	0	0	3	1.5	25	25	50	–
	PHP152	Oscillations, Waves & Optics Lab	Electrical								
			Mechanical								
	PHP153	Semiconductor Physics Lab	Electronics; EDT; Electronics & Comm.								
			Computer Science Engg; Information Tech.								
3.	MAT152/ MAT151	Differential Equations, Linear Algebra, Statistics & Probability / Calculus	All Branches	3	0/1	0	3/4	40	60	100	03
4.	MAP151	Computational Mathematics Lab	All Branches	0	0	2	1	25	25	50	–
5.	EET151	Basic Electrical Engineering	All Branches	3	1	0	4	40	60	100	03
6.	EEP151	Basic Electrical Engineering Lab	All Branches	0	0	2	1	25	25	50	–
7.	MET151	Engineering Graphics & Design	All Branches	1	0	0	1	40	60	100	03
8.	MEP151	Engineering Graphics & Design Lab	All Branches	0	0	4	2	50	50	100	–
9.	HUT152	Constitution of India	All Branches	2	0	0	0	–	–	–	–
10.	PEP151	Yoga/Sports	All Branches	0	0	2	0	–	–	–	–
			Total	12	2/3	13	**17.5/18.5**			**650**	

GROUP 1: SEMESTER-II

Sr. No.	Code	Course	Hours/week L	Hours/week T	Hours/week P	Credits	Maximum Marks: Continual Assessment	Maximum Marks: End Sem Examination	Maximum Marks: Total	ESE Duration (Hours)
1.	CHT151	Chemistry	1	0	2	4	40	60	100	03
2.	CHP151	Chemistry Lab	0	0	3	1.5	25	25	50	--
3.	MAT151/ MAT152	Calculus / Differential Equations, Linear Algebra, Statistics & Probability	3	1/0	0	4/3	40	60	100	03
4.	CST151	Programming for Problem Solving	4	0	0	4	40	60	100	03
5.	CSP151	Programming for Problem Solving Lab	0	0	2	1	25	25	50	--
6.	IDT151	Creativity, Innovation & Design Thinking	1	0	0	1	20	30	50	1.5
7.	INT151	Workshop/Manufacturing Practices Lab	1	0	0	1	20	30	50	1.5
8.	INP151	Workshop/Manufacturing Practices Lab	0	0	2	1	25	25	50	--
9.	HUT151	English	2	0	0	2	40	60	100	03
10.	HUP151	English Lab	0	0	2	1	25	25	50	--
		Total	14	2/1	9	**20.5/19.5**			**700**	

GROUP 2: SEMESTER-I / GROUP 1: SEMESTER-II

Sr. No.	Code	Course	Branches	Hours/week L	Hours/week T
1.	CHT151	Chemistry	All Branches	3	1
2.	CHP151	Chemistry Lab	All Branches	0	0
3.	MAT151/ MAT152	Calculus / Differential Equations, Linear Algebra, Statistics & Probability	All Branches	3	1/0
4.	CST151	Programming for Problem Solving	All Branches	4	0
5.	CSP151	Programming for Problem Solving Lab	All Branches	0	0
6.	IDT151	Creativity, Innovation & Design Thinking	All Branches	1	0
7.	INT151	Workshop/Manufacturing Practices Lab	All Branches	1	0
8.	INP151	Workshop/Manufacturing Practices Lab	All Branches	0	0
9.	HUT151	English	All Branches	2	0
10.	HUP151	English Lab	All Branches	0	0
		Total		14	2/1

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

Sr. No.	Course Code	Course Title	Hours per week L	T	P	Credits	Maximum Marks: Continuous Evaluation	End Sem Exam	Total	ESE Duration (Hrs)
1	MAT251	Maths III (Transform and Discrete Maths)	4	0	0	4	40	60	100	3
2	CET 251	Construction Materials	3	0	0	3	40	60	100	3
3	CEP 251	Construction Materials Lab	0	0	2	1	25	25	50	--
4	CET 252	Fluid Mechanics I	3	0	0	3	40	60	100	3
5	CEP 252	Fluid Mechanics I Lab	0	0	2	1	25	25	50	--
6	CET 253	Environmental Engineering I	3	0	0	3	40	60	100	3
7	CEP 253	Environmental Engineering I Lab	0	0	2	1	25	25	50	--
8	CET 254	Engineering Mechanics	3	1	0	4	40	60	100	3
9	CET 255	Solid Mechanics	3	0	0	3	40	60	100	3
10	CEP 255	Solid Mechanics Lab	0	0	2	1	25	25	50	--
		TOTAL	**19**	**1**	**8**	**24**				

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

Sr. No.	Course Code	Course Title	Hours per week L	T	P	Credits	Maximum Marks: Continuous Evaluation	End Sem Exam	Total	ESE Duration (Hrs)
1	CET 256	Fluid Mechanics II	3	1	0	4	40	60	100	3
2	CEP 256	Fluid Mechanics II Lab	0	0	2	1	25	25	50	--
3	CET 257	Geotechnical Engineering	3	1	0	4	40	60	100	3
4	CEP 257	Geotechnical Engineering Lab	0	0	2	1	25	25	50	--
5	CEP 258	Computer Aided Civil Engineering Drawing Lab	0	0	2	1	25	25	50	--
6	CET 259	Structural Analysis	3	1	0	4	40	60	100	3
7	CEP 259	Structural Analysis Lab	0	0	2	1	25	25	50	--
8	CET 260	Environmental Engineering II	3	0	0	3	40	60	100	3
9		Open Elective I	3	0	0	3	40	60	100	3
10	HUT260	Effective Technical Communication	3	0	0	3	40	60	100	3
		TOTAL	**18**	**3**	**8**	**25**				

Open Elective I	
Course Code	**Course Name**
CET299-1	Basic Building Components
CET299-2	Basics of Environmental Pollution

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

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	CET 351	Surveying and Geomatics	3	1	0	4	40	60	100	3
2	CEP 351	Surveying and Geomatics Lab	0	0	2	1	25	25	50	--
3	CET 352	RCC Structures	3	1	0	4	40	60	100	3
4	CEP 352	RCC Structures Lab	0	0	2	1	25	25	50	--
5	CET 353	Transportation Engineering	3	0	0	3	40	60	100	3
6	CEP 353	Transportation Engineering Lab	0	0	2	1	25	25	50	--
7	CET 354	Foundation Engineering	3	0	0	3	40	60	100	3
8		Open Elective II (Humanities)	3	0	0	3	40	60	100	3
9	HUT356	Organizational Behavior	3	0	0	0	--	--	--	--
		TOTAL	**18**	**2**	**6**	**20**				

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

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	CET 357	Estimation and Costing	3	0	0	3	40	60	100	3
2	CEP 357	Estimation and Costing Lab	0	0	2	1	25	25	50	--
3	CET 358	Steel Structures	3	0	0	3	40	60	100	3
4	CEP 358	Steel Structures Lab	0	0	2	1	25	25	50	3
5	CET 359	Hydrology & Water Resource Engineering	3	0	0	3	40	60	100	3
6	CET 360	Elective I	3	0	0	3	40	60	100	3
7	CET 361	Elective II	3	0	0	3	40	60	100	3
8		Open Elective III	3	0	0	3	40	60	100	3
9	CEP 363	Comprehensive Viva	0	0	2	1	25	25	50	--
		TOTAL	**18**	**0**	**6**	**21**				

Open Elective III	
Course Code	**Course Name**
CET399-1	Metro Systems and Engineering.

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

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	CET 451	Elective III	3	0	0	3	40	60	100	3
2	CET 452	Elective IV	3	0	0	3	40	60	100	3
3	CEP 452	Elective IV Lab	0	0	2	1	25	25	50	--
4	CET 453	Contracts Works Accounts and Management	2	0	0	2	40	60	100	3
5	CET 454	Construction Engineering and Management	3	0	0	3	40	60	100	3
6		Open Elective IV	3	0	0	3	40	60	100	3
7	CEP 456	Project Phase I	0	0	12	6	50	50	100	--
8	CEP 457	Industry Internship Evaluation (6-8 weeks)	0	0	2	0	--	--	--	--
		TOTAL	**14**	**0**	**16**	**21**				

Open Elective IV	
Course Code	**Course Name**
CET498-1	Green Building & Vastu Concepts

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

Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	CET 457	Elective V	3	0	0	3	40	60	100	3
2	CET 458	Elective VI	2	0	0	2	40	60	100	3
3	CEP 459	Project Phase II / One Semester Industry Project / Incubation	0	0	12	6	100	100	200	--
		TOTAL	**5**	**0**	**12**	**11**				

Scheme of Teaching & Examination of Bachelor of Engineering Honors Specialization (Civil Engineering)										
Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	CETH41	Construction Technology	4	0	0	4	40	60	100	3
2	CETH51	Geotechnical Design	4	0	0	4	40	60	100	3
3	CETH61	Fire-fighting system	4	0	0	4	40	60	100	3
4	CETH71	Foundation Design	4	0	0	4	40	60	100	3
5	CETH81-1	Design of Environmental Structures	4	0	0	4	40	60	100	3
6	CETH81-2	Geometric Design of Highways	4	0	0	4	40	60	100	3

Note: Credit transfer against above courses may be allowed if an appropriate MOOC course is completed by student after prior permission from HOD

Scheme of Teaching & Examination of Bachelor of Engineering Minors Specialization (Civil Engineering)										
Sr. No.	Course Code	Course Title	Hours per week			Credits	Maximum Marks			ESE Duration (Hrs)
			L	T	P		Continuous Evaluation	End Sem Exam	Total	
1	CETM41	Basics of Civil Engineering	4	0	0	4	40	60	100	3
2	CETM51	Basics of Surveying in Civil Engineering	4	0	0	4	40	60	100	3
3	CETM61	Basics of Soil Engineering	4	0	0	4	40	60	100	3
4	CETM71-1	Plumbing System	4	0	0	4	40	60	100	3
	CETM71-2	Intelligent Transport System	4	0	0	4	40	60	100	3
6	CETM81-1	Instrumentation	4	0	0	4	40	60	100	3
7	CETM81-2	Rural Water Supply & Sanitation	4	0	0	4	40	60	100	3

Note:-If any of the above course is accessible to a student in his/her parent branch or Open electives then Credit transfer against above courses may be allowed if an appropriate MOOC course is completed by student after prior permission from HOD.

List of Electives						
Semester	VI	VI	VII	VII	VII	VII
Course Code	CET 360	CET 361	CET 451	CET 452 / CEP 452	CET 457	CET 458
Elective Group	Elective I (Theory)	Elective II (Theory)	Elective III (Theory)	Elective IV (Theory + Practical)	Elective V (Theory)	Elective VI (Theory)
Structural Engineering	CET 360-1 Advanced Structural Analysis	CET 361-1 Advanced Concrete Technology	CET 451-1 Design of Concrete Structures	CET 452-1/CEP452-1 Computer Aided Design & Drafting	CET 453-1 Earthquake Resistant Design of RCC Structures	CET 454-1 Industrial Structures
Water Resources Engineering	CET 360-2 Irrigation Engineering	CET 361-2 Open Channel Flow	CET 451-2 Ground Water Engineering	CET452-2/ CEP452-2 Pipe line Engineering	CET 458-2 Design of Hydraulic Structures	CET 457-2 Watershed Management
Environmental Engineering	CET 360-3 Air Pollution & Control	CET 361-3 Solid Waste Management	CET 451-3 Environment Modeling	CET 452-3/CEP452-3 Water and Waste Water Treatment	CET457-3 Industrial Waste Water Treatment	CET458-3 Environm-ental Impact Assessment
Geotechnical Engineering	CET 360-4 Advanced Foundation Engineering	CET 361-4 Ground Improvement	CET 451-4 Earth & Earth Retaining Structures	CET 452-4/CEP452-4 Geotechnical Explorations	CET 457-4 Advanced Geotechnical Engineering	CET 454-4 Rock Mechanics
Transportation Engineering	CET 360-5 Pavement Design	CET 361-5 Urban Transportation Planning	CET 451-5 Railway Engineering	CET 452-5/CEP452-5 Traffic Engineering and Management	CET 457-5 Airport Planning	CET 458-5 Highway Construction & Management
Construction Engineering	CET 360-6 Advanced Construction Materials	CET 361-6 Repairs & Rehabilitation of Structures	CET 451-6 Contracts Management	CET 452-6/CEP452-6 Construction Project Planning & Systems	CET 457-6 Building Services	CET 458-6 Energy Efficient buildings
General	CET 360-7 Biology for Engineers	CET 361-7 Finite Element Method for Civil Engineers	CET 451-7 Numerical Methods for Civil Engineers	CET-452-7/CEP 452-7 Remote Sensing and GIS	CET 457-7 Disaster Preparedness and Planning	CET 458-7 Reuse of Industrial Wastes
	–	–	–	–	CET 457-8 Industry Elective I	CET 458-8 Industry Elective II

Syllabus for Semester I / II
(Civil Engineering, Industrial Engineering)

Course Code: PHT151 **Course : PHYSICS : Mechanics**
L: 3 Hrs. T: 1 Hrs. P: 0 Hrs. Per week **Total Credits: 4**

Course Objectives:

1. To develop working knowledge of methods to treat particle and rigid body motions;
2. To introduce kinematics and dynamics of general rigid body motions.

Course Outcomes:

After successful completion of the course students will

1. be able to understand and work with free, damped and forced oscillations;
2. be able to recognize and work problems with conservative as well as non-conservative forces ;
3. be able to use vector dierential operations in solving mechanics problems;
4. understand how to describe and solve simple general rigid body motions.

Module 1: Forces, Newton's Laws (8L)

Coordinate frames, change of frames as linear transformation, rotation matrix, Scalars and vectors - Denition based on their transformation under change of frames; Examples and problems; Newton's Laws of Motion, First law (law of inertia), inertial frame; Second law, concept of force; Third law; Forces in Nature, derived forces; friction, pressure in a fluid; Examples and problems including friction and constraints.

Module 2: One, and Two-dimensional Motion (7L)

One-dimensional harmonic oscillator, damped oscillator, over, critical and under damping; Forced oscillator, undamped and damped cases; Examples, resonance and Q factor; Projectile motion with drag; Two-dimensional oscillator; Charged particle in constant magnetic field.

Module 3: Conservative Forces (5L)

Work and kinetic energy: work-energy theorem, scalar and vector fields, Work done by a force field; Conservative and non-conservative forces, Potential energy function for conservative forces; Gradient of potential energy, $F = -\nabla V$; Curl of a vector field, test of conservation character of a force; Potential near equilibrium point.

Module 4: Angular Momentum, System of Particles (6L)

Angular momentum of a particle, torque of force; Radial-polar coordinates, Planetary orbits and Kepler's laws; elliptical, parabolic and hyperbolic trajectories; **' L'** of a system of particles, torque of external forces,

$$\frac{d\bar{L}}{dt} = \bar{N}_{ext}$$

Module 5: Rigid Body Dynamics-1 (5L)

Denition of a rigid body, rotation in a plane, angular momentum about a point of rigid body in planar motion about a fixed axis, Kinematics, concept of moment of inertia; The physical pendulum.

Module 6: Rigid Body Dynamics-2 (7L)

General rotation of a rigid body, Euler angles, angular velocity; Kinetic energy, moment of inertia tensor, examples, parallel axis theorem, angular momentum of a rigid body; Euler's equations of rigid body dynamics (statement and meaning without derivation), simple examples: rotating rod, torque-free precession.

Text Book(s):

1. Introduction to Mechanics (Second Edition), M. K. Verma, Universities Press 2016.

References:

1. An Introduction to Mechanics, Daniel Kleppner and Robert Kolenko, Cambridge University Press 2010.
2. Online course: Engineering Mechanics (Modules 1, 2,5, 6, 7, 8) by M K Harbola on NPTEL
3. Engineering Mechanics (Second Edition), M K Harbola, Cengage publications, New Delhi, 2013.

Syllabus for Semester BE I / II

Bachelor of Mechanical Engineering, Electrical Engineering

Course Code: PHT152 **Course: Oscillations, Waves, Optics**

L:3 Hrs.,T:1Hrs.,P:0Hrs.,Per week **Total Credits:4**

Course Objectives:

1. To train the student to work with oscillatory phenomena in electrical, mechanical and optical systems;
2. To introduce fundamental concepts and laws as relevant to electromagnetic waves and matter waves.

Course Outcomes:

After successful completion of the course students will understand and be able to work with

1. free, damped and forced oscillations;
2. fundamental properties of mechanical waves and their propagation across material boundaries;
3. phenomena of interference, diffraction of optical waves;
4. elementary understanding of quantum behavior of electrons in solids.

Module 1: Oscillations (8L)

Quick review of simple harmonic motion, mechanical and electrical oscillators, vector and complex number (phasor) representation, superposition of many SHMs of equal amplitude and equal succesive phase difference; Damped oscillations, under, critical and over-damping with stress on mechanical oscillators, problems; Forced oscillations with focus on mechanical oscillations, impedance of a mechanical circuit, forcing frequency dependence of velocity, displacement in a forced oscillator, two components of displacement, energy and power supplied by driving force, Q factor.

Module 2: Waves - 1 (5L)

Correlated harmonic oscillations in space and time, statement and meaning of the wave equation, general solution, concept of polarization of waves - transverse and logitudinal waves; Transverse wave on a string, characteristic impedance, reflection and transmission at a string-string boundary, impedance matching, insertion of quarter-wave element.

Module 3: Waves - 2 (5L)

Group of waves, group velocity, meaning of dispersion, causes of dispersion; Standing waves, normal modes of vibrating string, energy in modes, standing wave ratio; Longitudinal waves: sound waves in gases, statement and meaning of expressions for energy distribution and intensity.

Module 4: Wave Optics - 1 (6L)

Light as a transverse polarized electromagnetic wave in vacuum and in homogeneous isotropic dielectric, impedance $|\overline{E}|/|\overline{H} \perp E|$ Poynting vector, energy; Reflection and refraction of em wave at dielectric-dielectric boundary, parallel and perpendicular polarizations, boundary conditions on E and H components, Fresnel equations, Brewster's angle.

Module 5: Wave Optics - 2 (6L)

Huygens' principle, superposition, interference by division of amplitude and wavefront, Young's double-slit, Newton's rings, Michelson interferometer; Single-slit Fraunhofer diffraction, Rayleigh criterion for resolution, grating and its resolving power.

Module 6: Matter Waves (8L)

Plank's energy packets, Wave-particle duality of de Broglie, Heisenberg uncertainty relations; Wave function,ψ, for matter waves and its interpretation, position and momentum operators, Hamiltonian operator, Schrodinger's equation; One-dimensional single particle systems: Particle in an infinite square well potential (rigid box), finite square well potential; Quantum tunneling.

Text Book(s):

1. The Physics of Vibrations and Waves (Sixth Edition), H J Pain John-Wiley 2005.
2. Optics, Ajoy Ghatak Tata McGraw Hill Education 2005

References:

1. Online course: Oscillations and Waves by S Bharadwaj on NPTEL
2. Engineering Physics (Second Edition), Sanjay Jain and Girish Sahasrabudhe, Universities Press 2016.

Syllabus for Semester I / II

(Electronics Engineering, Electronics Design Technology, Electronics and Communication Engineering, Information Technology, Computer Science Engineering)

Course Code : PHT153 **Course: Semiconductor Physics**

L: 3 Hr., T: 1 Hrs., P : 0 Hrs., Per week **Total Credits : 4**

Course Objectives:

1. To introduce ideas of quantum mechanics necessary to begin understanding semiconductor devices;
2. To familiarize prospective engineers with fundamental concepts of semiconductors and their interaction with light and resulting devices

Course Outcomes:

After successful completion of the course students will

1. have an elementary understanding of quantum behavior of electrons in solids;
2. have a grasp of band structure and its consequences for semiconductors;
3. should be able to use band structure to explain effects of doping, properties of junctions between semiconductors and metals;
4. have an elementary understanding of working of optoelectronics devices

Module 1: Quantum Mechanics Introduction (8L)

Wave-particle duality, Heisenberg uncertainty relations, the quantum state - wave function and its probability interpretation, Schrodinger's equation, Energies and wave functions of a single electron in one-dimensional infinite and finite square well potentials: formulae, function graphs, number of bound states, Atomic orbitals, Concept of molecular bonding via overlap of orbitals and formation of molecular anti-bonding and bonding energy levels and wave functions: Qualiitative description only.

Module 2: Electronic Materials (8L)

Free electron theory, Extension of idea of energy level splitting in molecules to bonding in solids, Energy bands in solids, Kronig-Penny model (to better demonstrate origin of band gaps), Band gap based classication of electronic materials: metals, semiconductors, and insulators, E-k diagram, Direct and indirect bandgaps.

Module 3: Electrons in Semiconductors (4L)

Valence and conduction bands, Density of states, Fermi-Dirac statistics: Occupation probability of states, Fermi level, Effective mass, Phonons.

Module 4: Intrinsic and Extrinsic Semiconductors (6L)

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diusion and drift, p-n junction, Continuity equation, Metal-semiconductor junction (Ohmic and Schottky).

Module 5: Light - Semiconductors Interaction (6L)

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain, Semiconductor materials of interest for optoelectronic devices; Photovoltaic effect, Exciton, Drude model, LED, Photodiode.

Module 6: Engineered Semiconductor Materials (6L)

Low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Energies and wave functions in three dimensions with one, two, or all three dimensions of nano-sizes, Density of states for 2D, 1D and 0D electron gases, Hetero- junctions and associated band-diagrams.

Text Book(s):

1. Semiconductor Physics and Devices (Fourth Edition), Donald A Neamen, McGraw-Hill 2012.

References:

1. Online course: Semiconductor Optoelectronics by M R Shenoy on NPTEL
2. Online course: Optoelectronic Materials and Devices by Monica Katiyar and Deepak Gupta on NPTEL
3. Principles of Electronic Materials and Devices (Third Edition), S. O. Kasap, McGraw-Hill 2006.
4. Engineering Physics (Second Edition), Sanjay Jain and Girish Sahasrabudhe, Universities Press 2016.

Syllabus of Physics Lab for Semester II, Bachelor of Industrial, Civil Engineering

Course Code : PHP151 **Course : Mechanics Lab**

L:0 Hr., T:0Hrs., P:3 Hrs., Per week **Total Credits : 1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in physics and compare the results obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graph plotting and error analysis.

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

1. Error analysis and graph plotting
2. g by free fall
3. To determine acceleration due to gravity by compound pendulum
4. To determine the moment of inertia of a body using torsion pendulum
5. Young's modulus by bending of beam
6. Young's modulus by vibrational method
7. To study damping of a bar pendulum
8. Fixed pulley, loose pulley, and block and tackle as simple machine
9. Static friction, sliding friction, and rolling friction
10. Force oscillation and resonance
11. To study the oscillation of a mass in combinations of two springs and hence determination of force constant
12. Measurement of linear expansion of solid as a function of temperature
13. Determination of thermal conductivity of building materials using single plate model or heat flux plate principle
14. Thermal diffusivity Used for measuring the thermal diffusivity and thermal conductivity of brass.
15. Thermal conductivity of a bad conductor by Lee's disc method.
16. Data analysis using Mathematica.

Suggested References:

1. Physics Lab Manual written by the Teaching Faculty of Physics Department, RCOEM.
   A minimum of 8 experiments to be performed from the following list of experiments

Syllabus of Physics Lab for Semester I/II,

(Semester-I: Electrical Engineering, Semester-II: Mechanical Engineering)

Course Code : PHP152 **Course : Oscillations, Waves , Optics lab**

L: 0 Hrs. T: 0 Hrs. P: 3 Hrs. Per week **Total Credits : 1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in physics and compare the results obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graph plotting and error analysis.

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following lists as specific to Program:

1. Error analysis and graph plotting
2. Wave length, frequency and phase velocity of travelling wave.
3. Wavelength of source of light using Newton's rings
4. To study the oscillation in bifilar suspension arrangement
5. Determination of velocity of sound in liquid–standing ultrasonic waves as optical grating
6. Kundt's tube – Determination of the wavelength of sound with the cork powder method
7. Determination of velocity of sound in solid
8. Beating of ultrasonic waves
9. Investigation of Doppler effect with ultrasonic waves
10. Refractive Index of prism
11. Frequency, amplitude and phase determination using C.R.O.
12. Study of surface flatness using interference phenomena
13. To determine the resolving power of grating
14. Study of Polarizers and Analyzers
15. Study of total internal reflection using Laser source
16. Data analysis using Mathematica

Suggested References:

1. Physics Lab Manual written by the Teaching Faculty of Physics Department, RCOEM.
   A minimum of 8 experiments are to be performed from the above list of experiments.

Syllabus for Semester I/II, B.E. (2018-19)

(Semester I: Electronics, Electronics Design Technology, Electronics & Communication Engineering)

(Semester II: Computer Science Engineering and Information Technology)

Course Code : PHP153 **Course : Semiconductor Physics Lab**

L: 0 Hrs. T: 0 Hrs. P: 3 Hrs. Per week **Total Credits : 1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in physics and compare the results obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graph plotting and error analysis.

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following lists as specific to Program

1. Error analysis and graph plotting
2. Energy gap of semiconductor/thermister
3. Study of Hall Effect
4. Parameter extraction from I-V characteristics of a PN junction diode
5. Parameter extraction from I-V characteristics of a zener diode
6. Study of diode rectification
7. Parameter extraction from I-V characteristics of a transistor in common-emitterconfiguration.
8. Determination of Planck's constant
9. Determination of time constant of RC circuit
10. V-I Characteristics of Light Emitting Diodes
11. Study of a photodiode
12. Solar Cell (Photovoltaic cell)
13. Resistivity measurement by Four Probe method
14. Van der Pau and conventional techniques for resistivity measurement (LCR meter)
15. Study of R-C filters using C.R.O.
16. Data analysis using Mathematica.

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

Syllabus for B.E. Semester I

Course Code: MAT151 **Course: Mathematics-I: Calculus**

L: 3 Hrs., T: 1 Hrs., P: 0 Hrs., Per week **Total Credits: 04**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in Calculus and multivariate analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics & applications that they would find useful in their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions and the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
2. The tool of power series and Fourier series for learning advanced Engineering Mathematics.
3. To deal with functions of several variables that are essential in most branches of engineering.

Syllabus

Module 1 Calculus: (6 hours)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Module 2: Calculus: (6 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 3:Sequences and series: (10 hours)

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 4:Multivariable Calculus (Differentiation) (10 hours)

Limit, continuity and partial derivatives, Jacobians, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl & divergence.

Module 5: Multivariable Calculus (Integration) (10 hours)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune - 411030 (India).

Syllabus for B.E. Semester II

Course No. MAT152 — **Course : Mathematics-II: Differential Equations, Linear Algebra, Statistics & Probability**

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

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equation, statistics, probability and Matrices. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1. The effective mathematical tools for the solutions of ordinary differential equations that model physical processes.
2. The essential tool of matrices in a comprehensive manner.
3. The ideas of probability and various discrete and continuous probability distributions and the basic ideas of statistics including measures of central tendency, correlation and regression.

Syllabus

Module 1:First order ordinary differential equations(7 hours)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 2:Ordinary differential equations of higher orders (8 hours)

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation.

Module 3: Basic Statistics: (7 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression – Rank correlation, Multiple regression and correlation.

Module 4: Basic Probability: (8 hours)

Probability spaces, conditional probability, independence; Discrete random variables, Binomial distribution, Poisson distribution, Normal distribution. Relation between binomial, Poisson and Normal distributions.

Module 5: Matrices (10 hours)

Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Theory & Problems of probability and statistics : 2nd ed :J. R. Spiegal, Schaum series
8. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune - 411030 (India).
9. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus of Mathematics Computational Lab for Semester I/II, B.E. (2018-19)

Course Code : MAP151 — **Course : Computational Mathematics Lab**

L:0 Hr., T:0Hrs., P:2 Hrs., Per week — **Total Credits : 1**

Course Outcomes

The Computational Mathematics Lab course will consist of experiments demonstrating the principles of mathematics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in the lab and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in mathematics and compare the results obtained with theoretical calculations.
3. Understand basics of mathematics, and report the results obtained through proper programming.

The Lab turns will be utilized for performing the experiments based on the following list:

1. Calculus
2. Ordinary Differential Equations
3. Statistics
4. Linear Algebra

Suggested References:

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

A minimum of 8 experiments to be performed based on the above list.

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

Course Code : EET151 **Course : Basic Electrical Engineering**

Course Outcomes:

At the end of this course, students will demonstrate the ability

CO1: To understand and analyze basic electric and magnetic circuits.

CO2: To study the working principles of electrical machines and power converters.

CO3: To study the working principles of power converters.

CO4: To introduce the components of power systems and low-voltage electrical installations.

Module 1: Introduction to Power system (2 hours)– CO4:

Introduction to Power Generation (Thermal, Hydro, Nuclear, Wind, and Solar) with block schematic presentation only. Single line diagram for Generation, Transmission & Distribution through different voltage levels.

Module 2 : DC Circuits & Magnetic Circuits(8 hours) - CO1:

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation, Time-domain analysis of first order RL and RC circuits, Magnetic materials, BH characteristics, Basics of Magnetic circuits.

Module 3: Single Phase AC Circuits (6 hours) - CO1:

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance.

Module 4: Three Phase AC Circuits (4 hours) - CO1:

Three phase Ac generation, Three phase balanced circuits, voltage, and current relations in star and delta connections. Power factor improvement.

Module 5: Transformers (6 hours) - CO2:

Ideal and practical transformer, Equivalent circuit, losses in transformers, regulation, and efficiency. Auto transformer and three-phase transformer connections.

Module 6: Electrical Machines (8 hours) - CO2:

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components, efficiency, starting of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic, and speed control of separately excited dc motor.

Module 7: Power Converters (4 hours) - CO3:

Block schematic introduction to power converters and its practical applications (DC-DC, DC-AC, AC-DC, AC-AC), Types of Batteries, Important Characteristics for Batteries and battery backup.

Module 8: Electrical Installations (4 hours) - CO4:

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption, energy tariff.

Text / References:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
6. Electrical Technology: B. L. Thereja, S. Chand Publications.
7. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd.

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

Course Code : EEP151 **Course: Basic Electrical Engineering Lab.**

Laboratory Outcomes: The students are expected to

CO1: Get an exposure to common electrical components and their ratings.

CO2: Make electrical connections by wires of appropriate ratings.

CO3: Understand the usage of common electrical measuring instruments.

CO4: Understand the basic characteristics of transformers and electrical machines.

CO5: Get an exposure to the working of power electronic converters.

List of Laboratory Experiments/Demonstrations:

1. Basic safety precautions. Introduction & use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
   Observation of phase differences between current and voltage.
3. Transformers : Observation of the no-load current waveform on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-toneutral voltage, line and phase currents). Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of dc shunt motor.
7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections.
8. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

Syllabus of Department of Mechanical Engineering

Course Code : MET151 **Course: Engineering Graphics and Design**

L:1 Hr., T:0Hrs., P:0 Hrs., Per week **Total Credits : 01**

Course Outcomes

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

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

UNIT 1 : Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of drawing instruments, Lettering and dimensioning.

UNIT 2 : Orthographic Projections

Principles of Orthographic Projections -Conventions : Projections of Points and lines (line inclined to both planes) Projections of planes (inclined to both the planes), Introduction to Auxiliary Planes;

UNIT 3 : Projections of Solids

Inclined to both the Planes - Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include : windows, doors, and fixtures such as WC, bath, sink, shower, etc.

UNIT 4 : Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid Cone-Auxiliary Views; Development of surface of Right Regular solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT 5 : Isometric Projections

Principles of Isometric projection - Isometric Scale, Isometric Views, Conventions; Isometric Views of Simple Solids; Conversion of Orthographic views to Isometric Views / Projection.

Suggested Text / Reference Books :

i) Bhatt N. D. Panchal V.M. & Ingle P.R., (2014) Engineering Drawing, Charotar Publishing House.

ii) Jolhe D. A. (2016) Engineering Drawing with an Introduction to Auto CAD", Tata McGraw- Hill Publishing Co. Ltd., New Delhi.

iii) Narayan K. L. & P. Kannalah (2008), Text book on Engineering Drawing, Scitech Publishers.

iv) Shah, M. B. & Rana B. C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.

v) Agrawal B & Agrawal C. M. (2012), Engineering Graphic, TMH Publication.

vi) Corresponding set of CAD Software Theory and User Manuals.

Syllabus of Department of Mechanical Engineering

Course Code : MEP151 **Course: Engineering Graphics & Design Lab**

L:0 Hr., T:0Hrs., P:4 Hrs., Per week **Total Credits : 02**

Course Outcomes

Students are prepared for actual work situations through practical training in a new state of the art computer designed CAD laboratory using engineering software. The student will learn to :

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

UNIT 1 : Introduction to Engineering Drawing

Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloids, Hypocycloid and involutes; Introduction to Scales.

UNIT 2 : Orthographic Projections

Principles of Orthographic Projections -Conventions - Projections of Points and lines inclined to both planes; Projections of planes - Auxiliary Planes.

UNIT 3 : Projections of Solids

Inclined to both the Planes Auxiliary Views; Draw simple annotation, dimensioning and scale, Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

UNIT 4 : Sections and Sectional Views of Right Angular Solids

Prism Cylinder, Pyramid, Cone - Auxilary Views; Development of surfaces of Right Regular Solids Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT 5 : Isometric Projections

Principles of Isometric projection - Isometric Scale, Isometric Views, Conventions; Isometric Views of Simple Solids; conversion of Orthographic views to Isometric views / Projection

UNIT 6 : Overview of Computer Graphics

Demonstrating knowledge of the theory of CAD software such as (the Menu System Toolbars Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, crosshairs, Coordinate Systems), Dialog boxes and windows, Shortcut menus (Button Bars), The command Line (wherever applicable), The Status Bar, Different methods of zoom as used in CAD, select and erase objects; Isometric Views of lines, Planes, Simple and compound solids);

UNIT 7 : Customization & CAD Drawing

Setting up drawing page and the printer, including scale settings, Setting up of units and Drawing limits; ISO and ANSI standards for coordinate dimensioning; Orthographic constraints, map to objects, manually and automatically, Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

UNIT 8 : Annotations Layering & Other Functions

Applying dimensions to objects, applying annotations to drawings; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques.

UNIT 9 : Demonstration of a simple team design project that illustrates

Geometry And Topology Of Engineered Components Creation Of Engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; Meshed toplogies for engineering, Introduction to Building Information Modeling (BIM)

List of sheets

1. Curves (ellipse, Parabola, hyperbola, Cycloid, involute)
2. Line, Planes, Solids
3. Application of Section and development of solids
4. Orthgraphic Projection
5. Isometric
6. Auto CAD practic sheet 1
7. Auto CAD practice sheet 2
8. Blueprint sheet

Suggested Text/ Reference Books :

i) Bhatt N.D. Panchal V.M. & Ingle P.R., (2014), Engineering drawing, Charotar Publiishing house

ii) Jolhe D.A., (2016) Engineering drawing with an Introduction to Auto CAD", Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

iii) Shah M.B. & Rana B.C. (2008), Engineering drawing and Computer Graphic, Pearson Education.

iv) Agarwal B & Agarwal C.M. (2012), Engineering Graphics, TMH PUBLICATION

v) Narayana, K.L & P Kannaiah (2008), Text Book on Engineering Drawing, Scitech Publishers.

vi) (Concesponding set of) CAD Software Theory and USER Manuals.

Syllabus for B.E. Semester I Department of Humanities

Course Code : HUT152 — **Course : Constitution of India**

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

Course outcome

1. Students will understand the role of constitution in democratic India
2. Students will be responsible students by knowing their fundamental rights and duties
3. Students will develop better understanding of democratic functions of the government of India
4. Students will form better understanding of system of governance for effective participation

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the Fundamental Rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Union Executive: structure, functions
10. Judiciary: Structure, role with special reference to PIL, writ petitions, strengthening of democracy & social justice
11. Amendment of the Constitutional Powers and Procedure
12. Emergency Provisions: National Emergency, President Rule, Financial Emergency
13. Local Self Government – Constitutional Scheme in India
14. Provisions of civil services: Characteristics, functions, merits and demerits
15. Democratic principles in industry

Book

1. Durga Das Basu “An Introduction to Constitution of India” 22nd Edition, LexisNexis

Syllabus for B.E. Semester I Department of Humanities

Course Code : PEP151 **Course : Yoga / Sports**

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

Course outcome

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

1. Understand fundamental skills and basic rules of games offered by the Physical Education Department of RCOEM.
2. Obtained health related physical fitness.
3. Develop body-mind co-ordination through games and yoga.
4. Changed sedentary life styles towards active living.

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 to make the all-round development with team spirit, social values as well as to identify and develop leadership qualities in students through various sports activities. Sports activities would also be conducted with the objective to provide better interaction and recreation to the students which is an important neutralizer for stress. Additionally, the objective would be to evaluate the health related fitness of students so as to recommend and conduct specific Yoga and Sports activities. The emphasis is on participation, with healthy competition.

Programme Outline:

- **Sports :**
  1. Introduction to sports, offered by the department.
  2. Health and safety issues related to sports; knowledge, recognition and ability to deal with injuries and illness associated with sports.
  3. Practicing the fundamental skills and bringing awareness of basic rules and regulations.
  4. Conduction of small recreational games and activities.
- **Yoga :** Includes various sitting, standing and lying Asanas, Suryanamaskars and Pranayamas.
- **Physical Efficiency Tests :** This includes 6 health related physical fitness tests.

Components	Name of Tests
Speed	50 mts Dash
Agility	Shuttle run
Cardiovascular Endurance	8 mins Run/Walk
Test Flexibility	Sit and Reach Test
Abdominal Strength (M) / shoulder strength (F)	Bent Knee Sit-ups (M)/ Modified Pull-ups (F)
Yogic exercises	Suryanamaskars

Syllabus for B.E. Semester I / II

Course Code : CHT151 **Course : Chemistry**

L: 3 Hrs, T: 1 Hr, P : 0 Hr., Per week **Total Credits : 4**

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nano meter levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity.
- List major chemical reactions that are used in the synthesis of molecules.

(i) Chemistry-I (Concepts in Chemistry for Engineering)

(i) Atomic and molecular structure (12 lectures)

Schroedinger equation. Particle in box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

(ii) Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

(iii) Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

(iv) Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

(vi) Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry & chirality, enantiomers, diastereomers, optical activity, absolute configurations & conformational analysis. Isomerism in transitional metal compounds.

(vii) Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Text Books

(i) University chemistry, by B. H. Mahan
(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
(iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
(v) Physical Chemistry, by P. W. Atkins
(vi) Organic Chemistry: Structure & Function by K. P. C. Volhardt & N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp
(vii) Selected topics in Inorganic Chemistry by Malik, Madan & Tuli.

Syllabus for B.E. Semester I / II

Course Code : CHP151 **Course : Chemistry Lab**

L: 0 Hrs., T: 0 Hrs., P: 3 Hrs., Per week **Total Credits : 1.5**

Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials and impurities in water etc.
- Synthesize a polymer or drug molecule or nano-material.

List of Experiments for Chemistry Lab

1. Determination of Surface tension and Viscosity of a given liquid.
2. Determination of total hardness and alkalinity of a given water sample.
3. Synthesis of a polymer.
4. Determination of Cu and Zn in a brass sample.
5. Determination of partition coefficient of a substance between two immiscible liquids.
6. Study of chemical oscillations or iodine clock reaction.
7. Estimation of acid value and saponification value of oil.
8. Determination of cell constant and conductometric titration of strong acid vs. strong base.
9. Colligative properties using melting point.
10. Determination of rate constant of a reaction.
11. Ion Exchange column for removal of hardness.
12. Synthesis of nanoparticles.
13. Adsorption of acetic acid by charcoal.
14. Demonstration of UV-Visible spectrophotometer and FTIR

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

Course Code: CST151 **Course : Programming for Problem Solving**

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

Course Outcomes :

On successful completion of course student will learn:

1. To formulate simple algorithms for arithmetic and logical problems, translate the algorithms to programs (in C language), test and execute the programs and correct syntax and logical errors.
2. To implement conditional branching, iteration and recursion, to decompose a problem into functions and synthesize a complete program using divide and conquer approach.
3. To use arrays, pointers, structures and I/O operations for the formulation of algorithms and programs.
4. To apply programming to solve matrix addition, multiplication problems and searching & sorting problems.

UNIT-I: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm : Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. Arithmetic expressions and precedence

UNIT-II: C Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Preprocessor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch case, Loops and Writing and evaluation of conditionals and consequent branching.

UNIT-III: Arrays and Basic Algorithms

Arrays: 1-D, 2-D, Character arrays and Strings.

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT-IV: Functions and Recursion

User defined and Library Functions, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference. Recursion: As a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-V: Pointers and Structures

Structures, Defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers in self-referential structures, notion of linked list (no implementation)

UNIT-VI: File handling

Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Reading and writing the file, Closing the files, using fflush().

Text Books:

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

Reference Books:

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

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

Course Code: CSP151 **Course : Programming for Problem Solving Lab**

L: 0 Hrs., T: 0 Hrs., P: 2 Hrs., Per week **Total Credits : 1**

Course Outcomes :

On successful completion of course student will be able to:

1. Understand the fundamentals of C programming and choose the loops and decision making statements to solve and execute the given problem.
2. Implement different Operations on arrays also design functions to solve the given problem using C programming.
3. Understand pointers, structures, unions and apply them to develop programs.
4. Implement file Operations in C programming for a given application.

CREATIVITY INNOVATION AND DESIGN THINKING
COURSE SYLLABUS

Course Code : IDT151 **Credits:1**

L:1Hrs., T:0Hrs., P:0Hrs., Per week

Course Outcomes

C1: Be familiar with processes and methods of creative problem solving

C2: Enhance their creative and innovative thinking skills

C3: Practice thinking creatively and innovative design and development

Detailed Topics

UNIT I. Introduction: Making a case for creativity, Creative thinking as a skill, Valuing diversity in thinking: Thinking preferences, Creativity styles, Creativity in problem solving

UNIT 2. Pattern Breaking: Thinking differently , Lateral thinking, Mind stimulation: games, brain-twisters and puzzles, Idea-collection processes, Brainstorming/Brainwriting, The SCAMPER methods, Metaphoric thinking, Outrageous thinking , Mapping thoughts, Other (new approaches)

UNIT 3. Using Math and Science, Systematic logical thinking, Using math concepts, Eight-Dimensional (8D) Approach to Ideation: Uniqueness, Dimensionality, Directionality, Consolidation, Segmentation, Modification, Similarity, Experimentation

UNIT4. Systematic Inventive Thinking: Systematic inventive thinking: The TRIZ methodology, Decision and Evaluation: Focused thinking framework, Six thinking hats , Ethical considerations

UNIT 5. Design for Innovation: Introduction to design for interaction, nine lessons for innovation, difference in creativity and innovation, Building blocks for innovation

UNIT 6.Intellectual Property: Introduction to intellectual property: Patents, Copyrights©, Trademarks ®, Trade Secret, Unfair Competition.

Reference Books and Text Book :

1. Creative Problem Solving for Managers - Tony Proctor - Routledge Taylor & Francis Group
2. 101 Activities for Teaching creativity and Problem Solving - By Arthur B Vangundy - Pfeiffer
3. H. S. Fogler and S.E. LeBlanc, Strategies for Creative Problem Solving, Prentice Hall
4. E. Lumsdaine and M. Lumsdaine, Creative Problem Solving, McGraw Hill,
5. J. Goldenberg and D. Mazursky, Creativity in product innovation. Cambridge University Press, 2002.

Course Assignments for internal continuous assessment of 20 Marks (NO T1 and T2)

- Brain teasers (aka Puzzle Busters, to be solved individually)
- Cartoon captions (small teams)
- TRIZ, a systematic ideation method, reading (individual)
- Book readings and discussions (small teams)
- Small teams presentations on innovation: (1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering.
- Large groups hands-on projects
- Eight-dimensional (8D) ideation method examples
- Large teams videos

Syllabus Department of Industrial Engineering

Course Code : INT151 **Course : Workshop / Manufacturing Practices (Theory)**

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

Course Outcomes

1. Identify the different manufacturing process commonly employed in Industry along with prevailing safety practices.
2. Identify the various tools and equipments to carry out different manufacturing processes accompanied by the inspection of the work part.

Syllabus

Unit-1 Fundamentals of metal cutting, single point cutting tool, fundamental mechanics of metal cutting, fitting operations, and associated measuring and marking tools

Unit-2 Introduction to pattern making for metal casting, different types of carpentry tools, measuring tools and marking tools, holding devices, different types of carpentry joints.

Unit-3 Smithy and Forging, Forging tools like chisels, hammers, types of furnaces, types of coal, Forming operations, Hot working and Cold working of metals.

Unit-4 Metal joining Process, mechanics of welding, types of welding, soldering and brazing, types of joints

Unit-5 Introduction to foundries, Metal Casting, types of sand, Introduction to Molding tools & casting process.

Unit-6 Introduction to Plastic Injection Molding

Suggested Text Book

1. "Elements of Workshop Technology" Hajra S.K, Choudhury A. K , Roy Nirjhar Vol. I and Vol .II, Media Promoters and Publishers Private Ltd. Mumbai.

Reference Books

1. Kalpakjian S. and Schmid S. "Manufacturing Engineering and Technology"4th Edition, Pearson India Education 2008
2. Roy A. and Lindberg, "Process and Materials of Manufacture"4th Edition, Prentice Hall India 1998.

Syllabus Department of Industrial Engineering

Course Code : INP151 **Course : Workshop/Manufacturing Practices Lab (Practical)**

L:0Hrs.,T:0Hrs.,P:2Hrs.,Per week **Total Credits:1**

Laboratory Outcomes

On the completion of the course the students shall be able to;

1. Recognize the different manufacturing process commonly employed in the Industry
2. Make the components using required manufacturing process, inspection methods while practicing the requisite safety precautions

Contents

1. Fitting Practice
2. Welding and Soldering Practice
3. Pattern Making Practice
4. Metal Casting Practice
5. Smithy and Forging Practice
6. Machining Practice
7. Plastic Molding Process
8. Glass Cutting Process

Suggested Text Book

1. "Elements of Workshop Technology'" Hajra S.K, Choudhury A.K , Roy Nirjhar Vol. I and Vol .II, Media Promoters and Publishers Private Ltd Mumbai.

Reference Books

1. Kalpak Jain S. and Schmid S. "Manufacturing Engineering and Technology"4th Edition, Pearson India Education 2008
2. Roy A. and Lindberg, "Process and Materials of Manufacture", Prentice hall India 1998.

Syllabus for B.E. Semester I / II Dept of Humanities
Humanities and Social Sciences

Course Code: HUT151 **Course : English**

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

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 vocabulary of students.
2. To orient students in basic writing skills.
3. To orient students in functional grammar.
4. To orient students in the process of effective writing.
5. To provide practice and improve students' oral communication skills.

Course Outcomes

1. Students will have good word power.
2. Students will acquire basic writing skills.
3. Students will understand functional grammar and its usage.
4. Students will organize and express their thoughts effectively through written communication.
5. Students will learn oral communication skills in order to handle themselves effectively in an interview and group discussion

SYLLABUS

1. Vocabulary Building
- 1.1. The concept of Word Formation
- 1.2. Root words from foreign languages and their use in English
- 1.3. Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives
- 1.4. Synonyms, Antonyms and standard abbreviations

2. Basic Writing Skills
- 2.1 Sentence Structures
- 2.2 Use of phrases and clauses in sentences
- 2.3 Importance of proper punctuation
- 2.4 Creating coherence
- 2.5 Organizing principles of paragraphs in documents
- 2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing
- 3.1 Subject-verb agreement
- 3.2 Noun-pronoun agreement
- 3.3 Misplaced modifiers
- 3.4 Articles
- 3.5 Redundancies
- 3.6 Cliches

4. Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence

5. Writing Practices

5.1 Comprehension
5.2 Precis Writing
5.3 Essay Writing
5.4 Letter Writing
5.5 Email Writing

6. Oral Communication

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations : Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Books

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Syllabus for B.E. Semester I

Course Code: HUP151 | **Humanities and Social Sciences including Management courses** | **Course : English Lab**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week | **Total Credits: 1**

Course objective :

1. To enhance competency of communication in English among learners.

Course outcomes:

1. Students learn presentation and public speaking skills
2. Students learn to practice effective strategies for Personal Interview and Group Discussions
3. Students learn and effectively apply language skills – listening, speaking, reading and writing

List of Practical (2 hours each for each batch) based on unit 6 (oral communication).

1. Common Everyday Situations: Conversations and Dialogues
2. Pronunciation, Intonation , Stress, and Rhythm
3. Formal Presentations: Orientation
4. Formal Presentations : Practice Session
5. Interviews: Orientation
6. Interviews: Practice Session
7. Communication at Workplace: Group Discussion- Orientation
8. Communication at Workplace: Practice Session

Syllabus of B.E, Semester III

Course Code : MAT 251 **Course : Transform Calculus and Applied Statistics**

L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits : 04**

Course Objective:

The objective of this course is to expose student to understand the basic concepts of Laplace Transform, Fourier Series and Partial Differential Equations in Civil Engineering. It also focuses on Linear Programming Problems, Function of Complex variables and Numerical Methods / applied statistics.

Course Outcomes

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

1. Understand and use Laplace Transform, Function of Complex variables techniques for solving problems in Civil Engineering.
2. Understand Partial Differential Equations and use it to solve problems in civil engineering.
3. Understand the basic importance of Numerical Methods and Linear Programming to solve problems related to Engineering Applications.
4. Understand applied statistics to analyze data in civil engineering.

Syllabus

Module 1: Laplace Transform

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method.

Module 2: Partial Differential equations

Partial differential equation of first order first degree i.e. Lagrange's form, Solution of partial differential equation by separation of variables, Application to simple problems of vibration of strings & beams.

Module 3: Function of Complex Variables

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

Module 4: Linear Programming

Linear programming problems, basic theory, graphical solution method, the simplex method.

Module 5: Applied Statistics

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Module 6: Numerical Methods

Errors in numerical calculations, errors in series approximation. Rounding off errors, solution of algebraic and transcendental equations. Iteration method, False position method, Newton Raphson method and their convergence. Solution of system of linear equations, Gauss Seidal method, Crout's method

.Numerical solution of ordinary differential equation by Taylor's series method, Euler modified method, Runge- Kutta method.

Textbooks/References:

1. S.S.Sastry, Introductory methods of numerical analysis, PHI,4th Edition,2005.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Syllabus of B.E, Semester III

Course Code : CET 251 **Course : Construction Materials**

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

Course Outcomes:

1. The student shall be able to Identify, describe and explain the fundamental properties of, rocks and minerals.
2. The student shall be able to identify, and understand various building materials.
3. The students should be able to illustrate and control method of manufacture of concrete.
4. The students should be able to design and recommend the mix of concrete for given materials.

Unit I:

Mineralogy: Definition and classification of minerals, silicate structure, chemical and physical properties of minerals

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

Unit II

Introduction to various building components, Building materials such as; Masonry units, Flooring material, Roofing materials. IS-875 Part 1.

Application of geology to civil engineering projects, engineering properties of rocks,/

Building-stones, application of geology in location, design, and construction of dams, bridges and tunnels and building.

Unit III

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

Maturity of concrete

Unit IV : 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 to High Strength Concrete, Interfacial transition zone (ITZ)

Unit V : Mix Design

Statistical parameters of quality control

Factor affecting mix proportions

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

Numericals based on IS method

Unit VI : 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

Text books :

1. Concrete Technology by M.S. Shetty, published by S. Chand , Faridabad.
2. Properties of concrete, by A.M. Nevile, E.L.B.S London.
3. A text book of Engineering Geology: Pasbin Singh, S.K Kataria & Sons, New Delhi.
4. Building construction by Sushil Kumar, 16th Edition, Standard Publishers Distributors, 2006.

Reference book :

1. Concrete Technology (Theory and Practice) by M.L gambhir, McGraw Hill Publications, fifth edition.
2. Concrete technology by Santhakumar, Oxford Publication, New Delhi
3. Principles of Petrology, G.W. Tyrrell, Science paper backs.

Syllabus of B.E, Semester III

Course Code : CEP 251 **Course : Construction Materials**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week **Total Credits : 01**

Course Outcomes:

1. The students should be able to test various building material.
2. The students should be able to interpret the quality of material.
3. The students should be able to analyze various properties of various building material.

List of Practicals:

Minimum 10 of the following

Test on Bricks and Blocks

1. Water absorption
2. Compressive strength

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 covermeter.

Syllabus of B.E, Semester III

Course Code : CET 252 **Course : Fluid Mechanics I**

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

Course Outcomes:

The students would be able to,

1. To understand and describe properties of fluids, pressure measurement and broad principles of statics, kinematics and dynamics of fluid flow and studies of dimensional analysis.
2. To apply continuity, momentum and energy principles. Also development of systematic relationship between variables in various phenomenon of fluid flow applying methods dimensional analysis.
3. To understand, apply and analyse the working of various equipments for the measurement of velocity and discharge through pipe flows and open channel flows, tanks etc.
4. To compare effect of various parameters involved in fluids, fluids flows and its geometry.

Unit I :

a. Fluid Properties: Concepts of fluid, difference between solid, liquid and gases, basic properties of fluids Capillarity and its effect, dynamic and kinematic viscosity, Newton's law of viscosity, , rheological diagram, vapour pressure, Elasticity and compressibility, bulk modulus. Study of effect of pressure and temperature on various fluid properties.

b. Buoyancy and Floatation: Buoyant force and center of buoyancy, Archimedes principle, meta centre Stability of floating bodies.

Unit II : Pressure Measurement

Fluid pressure, Variation of fluid pressure with depth, pressure head, atmospheric, gage, vacuum pressure, relationship with diagram, pressure measurement using simple and differential manometer with formation of gage equation. Hydrostatics pressure on plane surface, Center of pressure and total pressure for fluid masses subjected to horizontal, vertical and inclined plane surface.

Unit III : Kinematics of flow

Velocity and its variation with space and time. Acceleration of fluid Particles, Lagrangian and Eulerian approaches in fluid flow description, type of flows. Equation of continuity in cartesian co-ordinate systems. Stream function and velocity potential function, free and forced vortices.

Unit IV : Kinetic of fluid flow

Forces influencing motion, various equations of motion, Bernoulli's equation and Its application and

limitations, Kinetic energy correction factor. Momentum equation & its application, Measurement of discharge through pipes using Venturimeter, Orifice meter. Measurement of velocity using Pitot tube.

Unit V :

a) **Orifice and Mouth piece**- definition, types, Hydraulic coefficients. Large orifice and submerged orifice. External and internal mouthpiece, running free and running full Mouthpiece.

b) **Notches and Weirs:** Definition, types, effect of end contraction, measurement of discharge. Cipolletti's weir, broad crested and submerged weirs.

Unit VI :

a. **Dimensional analysis**: Definition and use, fundamentals and derived dimensions, methods, application of methods to develop relationship in variables. Dimensionless numbers and its significance.

b. **Theory of model** : Similitude, geometric, kinematic and dynamic similarities, Reynolds and Froude model laws & its significance.

Text Books :

1. Hydraulics and fluid mechanics by Dr. P. N. Modi and S. M. Seth, latest edition, Standard book house.
2. Fluid Mechanics - Fundamentals and applications by Yunus cengel, John M Cimbala, Tata McGraw Hill Publishing Company Ltd New Delhi, latest edition /reprint.

Reference Books :

1. Theory and Application of Fluid Mechanics by K. Subramanaya, latest edition, Tata McGraw Hill Publishing Company Ltd New Delhi.
2. Fluid mechanics by Streeter and Wylie.

Syllabus of B.E, Semester III

Course Code : CEP 252 — **Course : Fluid Mechanics I**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week — **Total Credits : 01**

Course Outcomes:

The students would be able to,

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

List of Practical's

Minimum 8 out of the following :

1. Determination of Hydraulic coefficients of Orifices/ mouthpieces.
2. Determination of coefficient of discharge of Notches (Rectangular/ Triangular)
3. Determination of minor losses for G I pipe various sections.
4. Determination of coefficient of discharge for Venturi meter.
5. Determination of coefficient of discharge for Orifice meter.
6. Determination of Meta-centric height of ship model.
7. Verification of Bernoulli's Theorem.
8. Measurement of velocity and discharge of flow through pipe using ultrasonic flow meter.
9. Any other experiment employing self learning and other tools.

Syllabus of B.E, Semester III

Course Code : CET253 **Course : Environmental Engineering I**

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

Course Outcomes:

The students would be able to,

1. Describe and explain the necessity of water treatment along with the basic knowledge of various components of water supply scheme, treatment processes and distribution methodology.
2. Apply the knowledge of various principles, theories and equations in process analysis and in the design of various components of water supply scheme.

Unit I:

Introduction: Importance and need of planned water supply scheme, various components of water supply scheme.

Water Demand: Types of demand, factors affecting per capita demand, variation in demand, losses and theft, water audit, design period and population forecasting methods.

Sources of water: Various sources of surface water and ground water for water supply scheme including various intake structures, water balance,

Unit II:

Water quality: Physical, Chemical and bacteriological characteristics of water, environmental significance of various characteristics for different beneficial use, water quality standards (BIS and other latest standards and amendments), standard for packaged water general idea of waterborne diseases and its safety measures.

Water treatment: Objectives of treatment, various unit processes, treatment flow sheet of conventional water treatment plant and site selection criteria for water treatment plant.

Unit III:

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

Sedimentation: Principles, types of setting basins, efficiency of settling basin.

Coagulation and Flocculation: Significance, types of coagulants, coagulant doses, types of mixing and flocculation devices. Simple design of plain sedimentation and sedimentation with coagulation tank. Brief idea about clariflocculator

Unit IV:

Filtration: Importance of filtration, mechanism of filtration, types of filters - RSF, SSF, Pressure filters. Simple design of RSF and MGF

Disinfection: Necessity, Mechanisms, criteria for good disinfectant, various types of disinfectants, disinfection by chlorination using different forms of chlorine.

Miscellaneous: General idea about miscellaneous treatment processes latest methods

Unit V:

Conveyance of water: Types of pipes, joints, valves and testing methods of pipe lines. Hydraulic design aspects: Manning's, Darcy's, and Hazen-William formulas.

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

Unit VI:

Distribution systems: Ideal requirements for a good distribution system, types of distribution systems, System of water supply.24*7 water supply scheme, Fire hydrants

Storage reservoirs for treated water: Types, various capacities of reservoir, mass curve method for determination of storage reservoir capacity.

Text books:

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

Reference books:

1. Water Supply and Sewerage By M.J. McGhee (McGraw Hill)
2. Water Supply Engg. By P. N. Modi (Standard Book House)
3. CPHEEO Manual of water supply & treatment
4. WHO guidelines for drinking water standard
5. Handbook for design of water treatment plants by Dr. A.G. Bhole IWWA publication.

Syllabus of B.E, Semester III

Course Code : CEP253 **Course : Environmental Engineering I**

L: 0 Hrs. T: 0 Hrs. P:2 Hrs. Per week **Total Credits : 01**

Course Outcomes:

The student would be able to:

Determine the various characteristics of water and understand the significance of various characteristics of water along with the knowledge of drinking water standards and necessity of water treatment.

Understand various principles and instruments used in water analysis.

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
7. Determination Dissolved Oxygen
8. Determination Hardness
9. Determination Available Chlorine in bleaching powder
10. Determination of Residual Chlorine (Titrating method/coloroscope method)
11. Jar Test
12. Study practical of MPN and plate count tests.
13. Study practical of BOD test.
14. Determination of Sulphate
15. Determination of Nitrate

Reference :

Chemistry for environmental engineering and science by Sawyer and McCarty

EE-I, Civil Engineering Department, RCOEM, Laboratory Manual

Syllabus of B.E, Semester III

Course Code : CET254 **Course : Engineering Mechanics**

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

Course Objectives:

1. Apply basic knowledge of forces, moment and couples to create free body diagrams and solve equilibrium problems.
2. Apply knowledge of friction, simple machine, centroid and moment of Inertia to advanced courses of engineering.
3. Understand and analyse the problems based on Dynamics of Particles and Vibrations.

UNIT 1: Introduction to Engineering Mechanics

Force Systems,Basic concepts, System of Forces, CoplanarConcurrent Forces, Components in Space – Resultant- Moment of Forces and its Application;Couples and Resultant of Force System,

UNIT 2: Equilibrium

Equilibrium of System of Forces, Free bodydiagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems;Virtual displacements, principle of virtualwork for particle and system of rigid bodies,Analysis of truss using different methods.

UNIT 3: Friction

Types of friction, Limiting friction, Laws of Friction, Staticand Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screwjack; simple lifting machines

UNIT 4: *Centroid and Moment of Inertia*

Centroid of simple figures from firstprinciple, centroid of composite sections; Centre of Gravity and its implications; Areamoment of inertia- Definition, Moment of inertia of plane sections from first principles,Theorems of moment of inertia, Moment of inertia of standard sections and compositesections;.

UNIT 5: Mechanical Vibration

classification of vibration, damping and vibration, features of vibrating system, free vibration without damping, free vibration with damping, forced vibration without damping, forced vibration with damping, pendulum motion.

UNIT6: Particle dynamics:

Kinematics and Kinetics of particles, rectilinear motion, curvilinear motion, D'Alemberts principle and its application in connected system of particles, Impulse Momentum, Collision of bodies, Work Energy Method.

Text Books

1. Engineering Mechanics : F.L.Singer (Harper & Row Publication)
2. Fundamentals of Engineering Mechanics: A.K.Sharma, Sai Publication
3. Engineering Mechanics: A.K.Tayal, Umesh Publication
4. Engineering Mechanics: Basudeb Bhattacharya,(Oxford University Press)

Reference Books

1. Engineering Mechanics: Timoshenko & Young, Tata McGraw Hill
2. Engineering Mechanics: Bear Johnston, Tta McGraw Hill
3. Engineering Mechanics: I.H.Shames, Phi Pvt. Ltd.

Syllabus of B.E, Semester III

Course Code : CET255 **Course : Solid Mechanics**

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

Course Outcomes:

The students would be able to

CO1: Understand the behavior of materials under different stress and strain conditions.

CO2: Draw bending moment, shear force diagram and Analyze stresses in member under the different conditions of loading.

CO3: Determine deformations of simple members under various loading conditions.

Simple Stresses and Strains:

Concept of stress and strain, stress strain behavior of ductile and brittle material in uniaxial state of stress Elastic, plastic and strain hardened zones stress-strain relations, elastic constants, relation between elastic constants. Uniaxial loading and deformation of simple cases of statically inderminate problems under axial loading, Bars of varying section – composite bars – Temperature stresses temperature changes etc. Thin walled pressure vessels cylinder and spherical subjected to internal pressure.

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. SF and BM diagrams in beams (Cantilever, Simply supported, Overhang Beam).Relation between load and shear force and bending moment.

Stresses in beams

Assumption and derivation of simple a bending theory, relation between bending moment, bending stress and curvature for homogeneous and composite beams. Shear stresses in simple beams and shear stress distribution.

Deflection of beams and theory of columns

Relationship between moment, slope and deflection, Macaulay's method, double integration Method. Use of these methods to calculate slope and deflection for determinant beams. Buckling of columns and strut columns. Euler's and Rankine's formula.

Torsion of shafts

Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, Analysis of close-coiled -helical springs.

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 bending and torsion, Shear flow in thin walled sections, concept of shear center of thin walled section. Introduction of theories of failures.

Text Books :

1. S.S. Bhavikatti, Strength of Materials, 3rd Edition, Vikas Publishing House, 2008
2. Strength of Materials, 4th ed.: A. Pytel and F. L. Singer, Harper & Row, New York.
3. Strength of Materials: G. H. Ryder - Macmillan, India.
4. Strength of Materials a Rudimentary Approach: M.A. Jayaram, Sapna Book House, Bangalore.
5.Strength of Materials : R. K.Rajput, S Chand.
6. Engineering Mechanics of solids, Popav. ER Prentice Hill of India, New Delhi 2000

Reference Books :

1. Seely, F. B.; and Smith, J.O "Advanced Mechanics of Material", John Wiley and Sons. Inc.
2. Mechanics of materials: Beer & Johnson, McGraw - Hill Publishers.

Syllabus of B.E, Semester III

Course Code : CEP255 **Course : Solid Mechanics**
L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week **Total Credits : 01**

Course Outcomes:
Students will be able to
CO1. Understand the importance of elastic properties of different metals.
CO2. Know the behavior of different metals under different loading conditions such as tension, bending, torsion, shear etc and observe the failure pattern.
CO3. Observe the buckling shape of Column under various end condition and deformations of simple members.

Practicals :Minimum 10 of the following :

1. Study of elastic properties of metals.
2. Tension test on metals.
3. Compression test on metals.
4. Hardness test on metals.
5. Torsion test on metals.
6. Impact test on metals.
7. Deflection of springs.
8. Bending test on beams.
9. Verification of SFD and BMD by graphical solution.
10. Timber test. Strength and moisture content
11. Measurement of deflections in statically determinate beam
12. To study behavior of different types of columns and compare the Euler's buckling load for different end conditions.
13. Shear centre.

Syllabus of B.E, Semester IV

Course Code : CET256 **Course : Fluid Mechanics II**
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits : 03**

Course Outcomes:
The students would be able to,

1. Understand and describe various principal of flow through pipes, open channel and centrifugal pumps.
2. Apply basic principles of flow in pipes and open channel to solve fluid flow problems in steady state condition.
3. Analyse and design various components of fluid flow system and comparison of possible solutions.
4. Compare and interpret the data / information/concepts/principle and used for solving incompressible fluid flow problems in steady state condition.

Unit I :

Laminar Flow in Circular Pipes: Laminar flow in circular pipes and parallel plates; Velocity and shear stress distribution; Hagen-Poiseuille equation, concept of drag & lift and its simple application.

Unit II :

Flow through Pipes:

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

Unit III :

Flow through Open Channel:

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

Uniform Flow: Basics.- continuity, energy and momentum equations, Characteristics of uniform flow, computations of uniform flow.

Unit IV :

Non uniform flow (Critical Flow) : Basics and computations; Applications of specific energy concept, specific energy curve, gradual transition of channels, humps, width restrictions.

UNIT V :

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

Rapidly Varied Flow (RVF):, theory and classification of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular channel. Length, height, location and application of hydraulic jump. Energy dissipation , positive and negative surges.

UNIT VI :

Hydraulic Machines:

1. **Pumps:-** Basics, operating characteristics, pump head curve, system head curve, pumps in series & parallel, common problems and remedies; heads and efficiencies; specific speed; multistage pump for high head and large discharge; model testing of pump with applications of dimensional analysis .
2. **Turbines:-** Concept of turbines

Text Books :

1. Hydraulics and fluid mechanics including Hydraulic machines by Dr. P. N. Modi and S. M. Seth, Latest edition, Standard book house (2002).
2. Theory and application of fluid mechanics by K Subramanya ,Tata McGraw Hill Publishing Company Ltd New Delhi.
3. A textbook of Fluid Mechanics & Hydraulic Machines by R. K. Bansal.

Reference Books :

1. Fluid Mechanics & Hydraulic Machines by S. C. Gupta, Darling Kindersley (I) pvt. Ltd. Pearson lieensee, Nodia, UP.
2. Fluid Mechanics – Fundamentals and applications by Yunus cengel, Jhon M Cimbala, Tata McGraw Hill Publishing Company Ltd New Delhi, latest edition/ reprint.
3. Open Channel Hydraulics by V. T. Chow.

Syllabus of B.E, Semester IV

Course Code : CEP256 **Course : Fluid Mechanics II**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week **Total Credits : 01**

Course Outcomes:

The students would be able to,

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

List of Practicals :

Minimum 8 of the following:

1. To determine the value of friction factor for the major loss in flow through pipe.
2. Determination of Manning's constant for open channel.
3. Determination of Chezy's constant for open channel.
4. Developing specific energy diagram for a rectangular channel.
5. Study of GVF profiles.
6. Determination of spillway constant.
7. Analysis of water distribution system using Hardy Cross Delta Q Method.
8. Analysis of water distribution network using water GEMS
9. Any other experiments employing self learning and other tools.
10. Use of softwares or freewares like LOOP/BRANCH/EPANET for pipe flow analysis
11. Study of pelton wheel
12. Study of Fransis turbine

Syllabus of B.E, Semester IV

Course Code : CET257 **Course : Geotechnical Engineering**

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

Course Outcomes:

On successful completion of the course students will be able to

1. Identify various types of soils.
2. Identify, determine and correlate different properties of soil.
3. understand various methods for exploration.

Syllabus

Unit –I

Introduction: Origin of soil, formation of soil, Major deposits found in India. Various type of soil, soil structure

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

Unit –II

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

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

Unit –III

Permeability: Darcy's law & its validity, Discharge & seepage velocity, factors affecting permeability, soil stratification in soil mass, Determination of coefficients of permeability by laboratory and field methods, permeability of stratified soil.

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

Unit –IV

Compaction: Mechanics of compaction, factors affecting compaction, standard & modified proctor Tests, OMC, MDD, field compaction equipment, quality control, Consolidation: Terzaghi's 1-D consolidation theory, determination of coefficient of consolidation, degree of consolidation. Determination of pre-consolidation pressure.

Unit – V

Shear Strength – Concept of Mohr's stress circle, Mohr-Coloumb's theory, Drainage condition, Pore pressure and its measurement, shear strength by direct shear test, tri-axial test, unconfined compression test, vane shear test, sensitivity.

Unit – VI

Stress Distribution: Stress distribution in soil mass, Boussinesq's theory,point load, uniformly Loaded rectangular & circular areas, Newmark's influence chart, Equivalent point load method.

Text Book:

1. Basics and Applied Soil Mechanics – Gopal Ranjan & A S R Rao, New Age International Pub.
2. Geotechnical Engineering – C Ventakramaiah, New Age International Publications
3. Soil Mechanics and Foundation Engineering – B. C. Punmia, Laxmi Publications
4. Textbook of Soil Mechanics & Foundation Engineering - V N S Murthy, CBS Publishers.

Reference Book:

1. Textbook of Geotechnical Engineering – Braja M. Das, Cengage Publications
2. Fundamentals of Geotechnical Engineering – Braja M. Das, Cengage Publications
3. Modern Geotechnical Engineering – Alam Singh, CBS Publishers

Syllabus of B.E, Semester IV

Course Code : CEP257 **Course : Geotechnical Engineering**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week **Total Credits : 01**

Course Outcomes:

On successful completion of the course students will be able to

1. Field Identify of soils.
2. Determine index properties of soil.
3. Determine engineering properties of soil.

List of Practicals

Minimum 10 of the following:

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

Syllabus of B.E, Semester IV

Course Code : CEP258 **Course : Computer Aided Civil Engineering Drawing**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week **Total Credits : 01**

Course Outcomes

1. Student will able to draw dimensional sketches of building elements.
2. Students will able to understand and implement building byelaws in planning of building.
3. Students are able to plan and develop working drawing of residential building.
4. Students are able to plan and develop submission drawing of residential building.

List of practicals (Take any 10)

1. Drafting of dimensional sketches of the building elements.
2. Free hand drafting of the dimensional sketches of the building elements.
3. Study of the IS code provisions for the building drawing.
4. Study of building byelaws for government authorities.
5. Development of single line plan for residential building based on the requirements.
6. Development of working plan for single storied residential building based on the requirements (hand drafted).
7. Development of working plan for single storied residential building based on the requirements.
8. Development of working plan for multi storied residential building based on the requirements.
9. Study of various elements of submission drawing.
10. Development of submission drawing for single storied residential building.
11. Development of submission drawing for multi storied residential building.
12. Study of area calculation of submission drawing for flat scheme.

Syllabus of B.E, Semester IV

Course Code : CET259 **Course : Structural Analysis**

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

Course Outcome:

1. Able to analysis determinant and in-determinant structures
2. Able to understand Structural Responses and
3. Able to analyse field problems of Structural analysis and spread its knowledge to society.

Syllabus

Analysis of continuous beams propped cantilevers, portal frames with and without sway by Moment

Distribution Method

Influence line for rolling loads on beams with concentrated and uniformly distributed loads, for reactions, maximum B.M. and S.F, Influence lines for forces in members of simple trusses.

Analysis of **Two-Hinged and three hinged arches**, calculation of S.F. ,B.M and normal thrust.

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

Analysis of fixed and continuous beams by **theorem of three moments**, along with consideration of sinking of support

Strain energy method as applied to the analysis of redundant frames and redundant trusses up to two degrees

Introduction to **Direct stiffness method** for analysis of structures and its application to beams (upto 2 degree of freedom)

Introduction to conjugate beam method, column analogy and Moment area Method.

Reference Books:

1. Timoshenko S. P.; &Young D.H. “Theory of Structures; International edition”, McGraw Hill, 1965.
2. C.S.Reddy “Basics Structural Analysis” McGraw Hill 3rd edition 2010
3. Ghali, A.; & Neville A. M. “Structural Analysis A Unified Classical and Matrix Approach (4th Edition)”, E & FN SPON; Van Nostrand Reinhold, 1997.
4. Wang, C. K. “Indeterminate Structures”, Prentice Hall of India; 2000.
5. Schodek, D.L. “Structures (4th Edition)”, McGraw Hill International editions; 1983.
6. Meghre, A.S.; &Deshmukh, S.K. “Matrix Methods of Structural Analysis (1st Edition)”, Anand; CharotarPubls, 2003.
7. Weaver J.M.; & Gere, W. “Matrix Analysis of Framed Structures (3rd edition)”, Van Nostrand Reinhold; New York, 1990.
8. Jain, O.P. & Arya, A.S. “Theory and Analysis of Structures; Vol. I & II”, Nemchand Brothers; Roorkee.
9. Krishnamurthy D., “Theory of Structures”, J.K. Jain Brothers, 1976.
10. RajsekaranS., Shankarasubramanian G. “Computational of StructuralMechanics”, Prentice Hall of India Pvt. Ltd., New Delhi, 2001.

Syllabus of B.E, Semester IV

Course Code : CEP259 **Course : Structural Analysis**

L: 0 Hrs. T: 0 Hrs. P: 2 Hrs. Per week **Total Credits : 01**

Course Objective:

1) To enable students to determine the behavior of various structural members when subjected to different types of loadings.
2) Will be able to apply their knowledge of structural analysis in addressing analysis problems of structural engineering.

List of practical

1. To determine the deflection of two span continuous beams.
2. To find horizontal reaction of two hinged portal frame.
3. To draw influence line diagram of central reaction in a two span continuous beam.
4. To determine horizontal reaction of two hinged parabolic arch and draw the influence line diagram for horizontal thrust.
5. Verification of Maxwell's reciprocal theorem.
6. Application of standard structural analysis package for verifying SFD ,BMD and deflection for determinant beam subjected to different types of loads.
7. Verification of Three Moments Theorem using standard structural analysis package.
8. Verification of Moment Distribution Method using standard structural analysis package.
9. Verification of Strain Energy Method using standard structural analysis package.
10. Verification of Slope Deflection Method using standard structural analysis package.
11. To study Photo elasticity.
12. To determine the material fringe constant using compression method in two dimensional photo elasticity.lding.

Syllabus of B.E, Semester IV

Course Code : CET260 **Course : Environmental Engineering II**

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

Course Outcomes:

The students would be able to,

1. Describe and explain the necessity of wastewater treatment along with the basic knowledge of collection methodology, treatment processes and disposal methods.
2. Apply the knowledge of various principles, theories and equations in process analysis and in the design of various components of sewerage system.

Unit I:

General Aspects of waste water treatment: Necessity of treatment, classification of waste water, grey water and black water, system of sanitation, patterns of sewage collection systems. Estimation of storm water and sanitary waste water.

Conveyance of sewage: Types, shapes, hydraulic design of sewer.

Unit II:

Laying of sewer: Procedure for laying of sewer to grade, testing of sewer line.

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

House plumbing systems: Ideal requirements of HPS, types of HPS, types of pipes used in HPS, traps and its types, anti-syphonage.

Unit III:

Characteristics of sewage: Physical, chemical and biological characteristics of wastewater and its significance, BOD rate constant, BOD equation and its application to simple analysis.

Disposal of wastewater: Disposal standards, disposal by dilution, disposal by land treatment along with their advantages and disadvantages.

Unit IV:

Wastewater treatment: Wastewater treatment flow sheet and its site selection, preliminary and primary treatment - Screens, Grit chambers, Primary Settling Tank (including simple design).

Unit V:

Secondary treatment: Types of secondary treatment, principle of biological treatment, aerobic and anaerobic treatment processes, activated sludge process and trickling filter.

Treatment of sludge: Principle and necessity of sludge treatment, sludge digestion, sludge drying beds.

Unit VI:

Rural sanitation: Pit privy, aqua privy, twin pit toilets bio-gas recovery. Septic tank including soak pit, (including design problem), sullage (Grey water) collection, treatment and disposal, Facial sludge management.

Introduction to Reuse of Waste Water and Case Studies: Introduction to MBR SBR and constructed wet lands

General idea about various unit operations and treatment processes.

Text Books :

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

Reference Books :

1. S. K. Garg " Environmental Engineering Vol-II (Khanna Publication)
2. CPHEEO manual on sewerage and sewage treatment
3. Metcalf and Eddy "waste water treatment"

Syllabus of B.E, Semester IV

Course Code : HUT260 **Course : Effective Technical Communication**

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

Course Outcomes:

CO1: Students understand the process and types of communication.

CO2: Students understand the objectives of technical communication and role of audience in effective communication.

CO3: Students learn basic grammar rules, develop technical writing skills and produce effective workplace documents.

CO4: Students understand the process of research writing and develop skills to write documents for higher studies.

CO5: Students develop skills to enhance visual appeal of documents.

CO6: Students understand strategies for effective oral communication for professional needs.

Syllabus

Unit 1.Technical communication

Definition, Barriers of Communication, Objectives of technical communication, Promoting the product, Audience recognition and involvement.

Unit 2. Technical Writing

Process of Technical Writing, Types of Technical Writing

Letters: Job application, Job Description, and Resume, Sales, enquiry, complaint, order, follow-up letters, Organizational announcements, Minutes of the Meeting

Reports: Trip, Progress, Incident, Investigative, Feasibility/Recommendation reports, Project reports

Unit 3. Grammar and Editing

Functional Grammar: Punctuations, Mechanics, Active/ Passive, Transformation of sentences

Unit 4.Orientation in Research

Writing proposals, SOP, writing articles for journals and conferences, abstract and executive summary, thesis writing, Case Study evaluation, Case Studies

Unit 5. Preparation of Documents

Visual appeal: Document design, graphics, tables, poster presentations User manuals, Brochures, Fliers

Unit 6.Effective Oral Communication

Non- Verbal Communication, Public speaking, Presentations, Group Discussion and Interviews

Text Books:

1. Gerson and Gerson, "*Technical Communication: Process and Product*", 2018, Pearson
2. Meenakshi Raman and Sangeeta Sharma, "*Technical Communication: Principles and Practice*", 2015, Oxford University Press

Reference Books

1. S. Kumar and Pushplata, "*Communication Skills*", 2016, Oxford University Press
2. C. Muralikrishna and Sunita Mishra, "*Communication Skills for Engineers*", 2016, Pearson
3. Andrea Rutherfoord, "*Basic Communication Skills for Technology*", 2012, Pearson
   Barun K Mitra, "*Effective Technical Communication: A Guide for Scientists and Engineers*", 2006, Oxford

Syllabus of B.E, Semester IV, Open Electives

Course Code : CET299-1 **Course : OE I -Basic Building Components**

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

Course Outcomes:

1. Able to understand various structures
2. Able to understand components of building with its utility.
4. Able to understand material used for building construction with suitability.

Unit I

Types of Civil Engineering structures: Building, Types of building, Load bearing and framed structures. Foundations: Necessity and types of foundations. Introduction to shallow foundations and deep foundation. Causes of failures of foundations and remedial measures.

Unit II

Masonry : Types of Wall: load bearing, partition, parapet wall and cavity walls, Masonry and its types, Various building units and its terminology used header, stretcher, bonds, closure bricks. Masonry construction using various building units such as Mud bricks, stone, bricks, AAC, hallow concrete block with suitability and constrains.

Unit III

Lintel and arches : functions and suitability, types chajjas. Pre cast lintels & Arches. Stairs: Types of stairs, functional design of stairs. Introduction of Lift and Escalators.

Unit IV

Floors : Necessity and Types of flooring- floor tiles, synthetic & Ceramic Tiles, vitrified tiles, chequered tiles, paving blocks, wooden floor.

Roofs : Types of Roof, roof material, Thermal Insulation treatment methods, water proofing

Unit V

Doors and Windows: Purpose materials of construction and types.

Unit VI

Plastering: Necessity, procedure of construction, Pointing, Mortar with its types.

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

Damp Proofing: Causes and effect of dampness. Various methods of damp proofing, Damp proofing of plinth Heat and sound insulation.

Text Books:

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

Reference Books:

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

Syllabus of B.E, Semester IV, Open Electives

Course Code : CET299-2 **Course : OE I Basics of Environmental Pollution**

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

Course Outcomes:

The students would be able to,

1. Understand the basic knowledge about causes and effects of air pollution along with its control methodology.
2. Understand the basics of solid waste management.

UNIT-I

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

•Lapse rates & atmospheric stability, meteorological parameters affecting dispersion of air pollutants, plume behavior, wind rose, estimation of stack height, greenhouse effect, atmospheric ozone depletion, climate change and relevant topics

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 latest standards
•Noise pollution: Sources, ill effects, control measures.

UNIT-III

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

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

UNIT-IV

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

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

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

Concept of life cycle assessment, organic waste division, waste to wealth, climate change and circular economy

Text Books:

1. Air pollution by M. N. Rao and H. V. N. Rao, (Tata McGraw Hill publications)
2. Environmental Pollution Control Engineering by C. S. Rao, (Wiley Estern Ltd.)
3. Solid waster management in developing countries by A. D. Bhide and B. B. Sundersan (INSDOC, New Delhi)

Reference Books:

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

Syllabus of B.E, Semester IV, Honors Specialization

Course Code : CETH41 **Course : Construction Technology**

L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits : 04**

Course Outcomes:

1. Students will be familiar with the technology of major construction as outlined in the listed topic headings.
2. Students will be able to describe, analyze, compare and evaluate the technology of special construction
3. Student will be aware of some of the problems that can be associated with poor management of construction projects.

Syllabus:

- Form work: Design and scaffolding, slip form and other moving forms techniques. Mechanization in rebar fabrication.
- Steel and composites construction methods: Fabrication and erection of structures including heavy structures,
- General Principles of Pre-Fabrication(Precast & Pre-Engineered Building), Comparison with monolithic construction, Types of Prefabrication, site and plant prefabrication, Economy of prefabrication, Modular coordination, Standardization , Planning for Components of prefabricated structures, Disuniting of structures
- Mechanization through construction methods/technologies: segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology.
- Prestressed concrete construction-Principle, methods, materials, Tools and equipment for the construction of a prestressed structures.

REFERENCE:

1. Purifoy, Schexnayder, Construction Planning, Equipment and Methods, Tata Mc Graw Hill
2. Edward Nawy , Concrete Construction and engineering Handbook , CRC Press
3. National Building Code -2005.

Syllabus of B.E, Semester IV, Minors Specilaization

Course Code : CETM41 **Course : Basics of Civil Engineering**

L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week **Total Credits : 04**

Course Outcomes:

The students would be able to,

1. Understand and describe basics of Building Components & Planning , Construction Materials , Survey and Transportation Engineering, Environment and Water Resource Management .
2. Apply basic principles of various types of Civil Engineering work to solve problems.
3. Apply and analyze various functional principles/ components of Civil Engineering work and compare possible solutions.
4. Compare and interpret the data / information/concepts/principle and used for solving the problems associated with basic infrastructure development.

Unit –I: Introduction to Civil Engineering (7 Hrs)

Role of civil Engineers in the infrastructure development. Selection of site, basic functions of buildings, types of buildings – Residential, Public, Commercial, and Industrial. Principles of planning, orientation of buildings, introduction to bye-laws regarding building height, setbacks (margins) open space requirement, , F.S.I., Carpet area, built up area, , plinth area, ventilation.

Unit II- Building Components & Building Planning (5hrs)

Foundation and superstructure, functions of foundation, types of shallow and deep foundations,

Suitability in different situation, plinth, walls, lintels, beams, columns, slabs, roofs, staircases,

Floors, doors & windows, various levels of structure, Study of Building plans, ventilation, basics of plumbing and sanitary works. Types of construction as Load Bearing, Framed, and Composite

Unit III - Construction Materials (5Hrs)

Basic engineering properties and uses of construction materials: ; cement, bricks, timber , stone, aggregates, bitumen, glass, FRP, composite materials , reinforcing steel, structural glazing, structural steel; Concrete types: PCC, RCC, and Ready Mix Concrete.

Unit – IV: Basics of Survey and Transportation Engineering (7 Hrs)

Basics of Surveying

Principles of survey, Various types of maps and their uses; introduction to levelling, concept of benchmarks, reduced level, contours, theodolite, Total Station. Introduction to GIS, GPS and their applications.

Transportation Engineering

Various modes of transportation, Classification of road, Types of Pavements, Traffic Signs, markings, signals, Road traffic safety.

Unit –V Environment and Water Resource Management (8 Hrs)

Water supply - Sources, Standards of purified water and its requirements, impurities in water and their effects; Purification of water, Storage of water , water conveyance systems; Ground water recharge-Roof top rain water harvesting and methods. Waste Management: Collection and Disposal methods of Liquid and solid wastes.

Unit –VI: (4 Hrs)

Instrumentation in Civil Engineering:

Various Instruments used in construction, condition monitoring equipments Foundation Engineering Potentiometers, Strain Gauges. Management of Utilities using telemetry & SCADA System. Role of Engineers in Sustainable Development

Books Recommended:

1. Elements of Civil Engineering: By S. S. Bhavikatti
2. Basic Civil Engineering: By Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain.
3. Concrete Technology: By M. S. Shetty
4. Surveying and Levelling: By Kanetkar and Kulkarni
5. Water Supply And Sanitary Engineering: By G. S. Birdie, J. S. Birdie
6. Building Construction: By Sushil Kumar
7. Transportation Engineering: By Khanna & Justo
8. Building Drawing Design: By Shah and Kale
9. Construction Planning , Equipments And Methods: Robert Peurifoy, Clifford J. Schexnayder, Aviad Shapira and Robert Schmitt.

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