SYLLABUS

DIPLOMA IN CIVIL ENGINEERING

(DAY COURSES)

w.e.f. - 2025

UNIVERSITY POLYTECHNIC
FACULTY OF ENGINEERING & TECHNOLOGY
JAMIA MILLIA ISLAMIA
NEW DELHI - 110 025

Index

Program Educational Objectives (PEOs)

PEO 1	Apply the principles of Civil Engineering in different areas practically
PEO 2	Prepare the diploma students with employability skills
PEO 3	Motivate the students to pursue higher education Such as graduate education or other training programs in engineering science or other professional fields.
PEO 4	Inculcate the entrepreneurship skills among the students
PEO 5	Prepare the students with professional background and ethical behavior, social responsibility, and diversity, both as individuals and in team environments.

Program Outcomes (POs)

The students of Diploma in Civil Engineering will be able to demonstrate the following:

PO 1	An ability to apply knowledge of mathematics, science, and engineering to design, conduct experiments, analyze and provide solution for engineering problems
PO 2	An ability to apply discipline - specific knowledge with an understanding of the limitations to solve core and / or applied engineering problems
PO 3	Demonstrate knowledge to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
PO 4	Understand and apply professional ethics and responsibilities and norms of the engineering practice.
PO 5	An ability to function as an individual, and as a member or leader in diverse / multidisciplinary teams.
PO 6	An ability to identify, formulate, and solve engineering problems
PO 7	An ability to communicate effectively
PO 8	A recognition of the need for, and an ability to engage in lifelong learning
PO 9	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
PO 10	Ability to engage in independent and life-long learning in the context of technological changes.

Course Structure

Diploma in Civil Engineering Program

S. No.	Category	Category Code of Courses	Allocation of Breakup of Credits
1	Humanities & Social Science Courses	HS	8
2	Basic Science Courses	BS	14
3	Engineering Science Courses	ES	21
4	Program Core Courses (Branch specific)	PC	48
5	Program Elective Courses (Branch specific)	PE	12
6	Open Elective Courses (from other technical and/or emerging subjects)	OE	6
7	Project	PR	11
	Seminar	SE	
	Summer Internship (in industry or elsewhere)	SI	
8	Audit Courses	AU	
Total			**120**

Evaluation Scheme

Diploma in Civil Engineering, University Polytechnic, Jamia Millia Islamia, New Delhi

Semester-I

S. No.	Code No.	Subject	Course Type	Periods Per Week			Credits	Distribution of Marks		
				L	T	P		Internal Assesment	University Examination	Total
Theory Courses:										
1	CEES101	Engineering Mechanics	ES	2	1	0	3	60	90	150
2	CEBS102	Applied Chemistry	BS	2	1	0	3	60	90	150
3	MEES103	Fundamentals of Mechanical Engineering	ES	2	1	0	3	60	90	150
4	ECES104	Fundamentals of Electronics Engineering	ES	2	0	0	2	40	60	100
5	CEBS105	Applied Mathematics-I	BS	2	1	0	3	60	90	150
Practical Courses:										
1	CEES111	Engineering Mechanics Lab	ES	0	0	2	1	30	20	50
2	CEBS112	Applied Chemistry Lab	BS	0	0	2	1	30	20	50
3	ECES114	Fundamentals of Electronics Engineering Lab	ES	0	0	2	1	30	20	50
4	MEES116	Engineering Workshop Practice	ES	0	0	4	2	60	40	100
5	CEHS117	Sports & Yoga Lab	HS	0	0	2	1	30	20	50
Total							**20**	**460**	**540**	**1000**

ES: Engineering Science Courses
BS: Basic Science Courses
HS: Humanities & Social Science Courses

Evaluation Scheme

Diploma in Civil Engineering, University Polytechnic, Jamia Millia Islamia, New Delhi

Semester-II

S. No.	Code No.	Subject	Course Type	Periods Per Week			Credits	Distribution of Marks		
				L	T	P		Internal Assesment	University Examination	Total
Theory Courses:										
1	CEHS201	Communication Skills	HS	2	1	0	3	60	90	150
2	CEBS202	Applied Physics	BS	2	1	0	3	60	90	150
3	COES203	IT Systems and Computer Programming	ES	2	0	0	2	40	60	100
4	EEES204	Fundamentals of Electrical Engineering	ES	2	0	0	2	40	60	100
5	CEBS205	Applied Mathermatics-II	BS	2	1	0	3	60	90	150
Practical Courses:										
1	CEHS211	Communication Skills Lab	HS	0	0	2	1	30	20	50
2	CEBS212	Applied Physics Lab	BS	0	0	2	1	30	20	50
3	COES213	IT Systems and Computer Programming Lab	ES	0	0	4	2	60	40	100
4	EEES214	Fundamentals of Electrical Engineering Lab	ES	0	0	2	1	30	20	50
5	MEES216	Engineering Graphics	ES	0	0	4	2	60	40	100
Audit Courses:										
1	CEAU200	Environmental Science	AU	2	0	0	0			
Total							**20**	**470**	**530**	**1000**

HS: Humanities & Social Science Courses
BS: Basic Science Courses
ES: Engineering Science Courses
AU: Audit Courses

Note: Summer Internship-I of 4 weeks after II sem

Evaluation Scheme

Diploma in Civil Engineering, University Polytechnic, Jamia Millia Islamia, New Delhi

Semester-III

S. No.	Code No.	Subject	Course Type	Periods Per Week			Credits	Distribution of Marks		
				L	T	P		Internal Assesment	University Examination	Total
Theory Courses:										
1	CEPC301	Basic Surveying	PC	2	0	0	2	40	60	100
2	CEPC302	Building Materials & Construction	PC	3	0	0	3	60	90	150
3	CEPC303	Hydraulics	PC	3	0	0	3	60	90	150
4	CEPC304	Mechanics of Materials	PC	3	0	0	3	60	90	150
5	CEPC305	Water Resources Engineering	PC	3	0	0	3	60	90	150
Practical Courses:										
1	CEPC311	Basic Surveying Lab	PC	0	0	2	1	30	20	50
2	CEPC312	Building Materials & Construction Lab	PC	0	0	2	1	30	20	50
3	CEPC313	Hydraulics Lab	PC	0	0	2	1	30	20	50
4	CEPC314	Mechanics of Materials Lab	PC	0	0	2	1	30	20	50
5	CESI316	Summer Internship-I	SI	0	0	0	2	100		100
Total							**20**	**500**	**500**	**1000**

PC: Program Core Courses

SI: Summer Internship

Evaluation Scheme

Diploma in Civil Engineering, University Polytechnic, Jamia Millia Islamia, New Delhi

Semester-IV

S. No.	Code No.	Subject	Course Type	Periods Per Week			Credits	Distribution of Marks		
				L	T	P		Internal Assesment	University Examination	Total
Theory Courses:										
1	CEPC401	Advanced Surveying	PC	3	0	0	3	60	90	150
2	CEPC402	Concrete Technology	PC	2	0	0	2	40	60	100
3	CEPC403	Geotechnical Engineering	PC	2	0	0	2	40	60	100
4	CEPC404	Theory of Structures	PC	3	0	0	3	60	90	150
5	CEPE405	Solid Waste Management	PE	3	0	0	3	60	90	150
Practical Courses:										
1	CEPC411	Advanced Surveying Lab	PC	0	0	2	1	30	20	50
2	CEPC412	Concrete Technology Lab	PC	0	0	2	1	30	20	50
3	CEPC413	Geotechnical Engineering Lab	PC	0	0	2	1	30	20	50
4	CEPR416	Minor Project	PR	0	0	4	2	60	40	100
5	CEPC417	Building Planning and Drawing Lab	PC	0	0	4	2	60	40	100
Audit Courses:										
1	CEAU400	Essence of Indian Knowledge and Tradition	AU	2	0	0	0			
Total							**20**	**470**	**530**	**1000**

PC: Program Core Courses
PE: Program Elective Courses
AU: Audit Courses
PR: Project

Note: Summer Internship-II of 4 weeks after IV semester

Evaluation Scheme

Diploma in Civil Engineering, University Polytechnic, Jamia Millia Islamia, New Delhi

Semester-V

S. No.	Code No.	Subject	Course Type	Periods Per Week			Credits	Distribution of Marks		
				L	T	P		Internal Assesment	University Examination	Total
Theory Courses:										
1	CEPE501	Design of Steel Structures	PE	3	0	0	3	60	90	150
2	CEPE502	Design of R.C.C Structures	PE	3	0	0	3	60	90	150
3	CEPC503	Transportation Engineering	PC	3	0	0	3	60	90	150
4	CEPC504	Estimating, Costing and Valuation	PC	2	0	0	2	40	60	100
5	ME/CEOE505	Construction Management	OE	3	0	0	3	60	90	150
Practical Courses:										
1	CEPC513	Transportation Engineering Lab	PC	0	0	2	1	30	20	50
2	CEPC514	Estimating, Costing and Valuation Lab	PC	0	0	2	1	30	20	50
3	CESI516	Summer Internship-II	SI	0	0	0	2	60	40	100
4	CEPR517	Major Project-I	PR	0	0	2	1	50	-	50
5	CEPC518	Structural Engineering Drawing Lab	PC	0	0	2	1	30	20	50
Total							**20**	**480**	**520**	**1000**

PC: Program Core Courses
PE: Program Elective Courses
SI: Summer Internship
OE: Open Elective
PR: Project

Evaluation Scheme

Diploma in Civil Engineering, University Polytechnic, Jamia Millia Islamia, New Delhi

Semester-VI

S. No.	Code No.	Subject	Course Type	Periods Per Week			Credits	Distribution of Marks		
				L	T	P		Internal Assesment	University Examination	Total
Theory Courses:										
1	CEPC601	Public Health Engineering	PC	3	0	0	3	60	90	150
2	CEPE602	Advanced Design of R.C.C Structures	PE	3	0	0	3	60	90	150
3	ME/CEOE603	Project Management	OE	3	0	0	3	60	90	150
4	CEHS604	Entrepreneurship and Startups	HS	2	1	0	3	60	90	150
Practical Courses:										
1	CEPC611	Public Health Engineering Lab	PC	0	0	4	2	60	40	100
2	CEPC615	Structural Engineering Software Lab	PC	0	0	4	2	60	40	100
3	CESE616	Seminar	SE	0	0	2	1	50	-	50
4	CEPR617	Major Project-II	PR	0	0	6	3	90	60	150
Audit Courses:										
1	CEAU600	Indian Constitution	AU	2	0	0	0			
Total							**20**	**500**	**500**	**1000**

PC: Program Core Courses
PE: Program Elective Courses
OE: Open Elective Courses
AU: Audit Courses
SE: Seminar
PR: Project
HS: Humanities & Social Science Courses

Course Code	:	CEES 101
Course Title	:	Engineering Mechanics
Number of Credits	:	3 (L:2, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:
Following are the objectives of this course:

- To obtain resultant of various forces and support reactions through condition of equilibrium
- To know the centre of gravity and moment of inertia of composite
- To understand motion, work, power and energy
- To understand role of friction in equilibrium problems
- To know fundamental laws of machines and their applications to various engineering problems

Course Content:

Unit–I Basics of mechanics and force system

Basics of Mechanics: Significance and relevance of Mechanics, Applied mechanics, Statics, Dynamics. Space, time, mass, particle, flexible body and rigid body, scalar and vector quantity, units of measurement (SI units) - Fundamental units and derived units.

Force Systems: units, representation as a vector and by Bow's notation, characteristics and effects of a force, principle of transmissibility of force, force system and its classification, resolution of a force -orthogonal components of a force, Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel co-planar force systems– Law of triangle, parallelogram and polygon of forces.

Unit– II Equilibrium

Force: Equilibrium and Equilibrant, Free body and Free body diagram, Analytical and graphical methods of analyzing equilibrium, Lami's Theorem – statement and explanation, Application for various engineering problems.

Moment: Moment of a force, Varignon's theorem, Types of beam, supports (simple, hinged, roller and fixed) and loads acting on beam (vertical and inclined point load, uniformly distributed load, couple), Beam reaction for cantilever, simply supported beam with or without overhang – subjected to combination of point load and uniformly distributed load, beam reaction graphically for simply supported beam subjected to vertical point loads only.

Unit– III Centre of gravity and Moment of Inertia

Centre of Gravity: Centre of gravity and centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle). Centroid of composite figures composed of not more than three geometrical figure. Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere), Centre of Gravity of composite solids composed of not more than two simple solids.

Moment of Inertia: Definition, M.I. of plane lamina, Radius of gyration, section modulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations), M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections and built up sections about centroidal axes and any other reference axis, Polar moment of Inertia of solid circular sections.

UNIT- IV Motion, Work, Power and Energy

Rectilinear Motion: Newton's law of motion, momentum, conservation of momentum, impulse, torque

Circular motion: Angular motion, Equation of motion, angular momentum, torque, centripetal and centrifugal force.

Work, Power & Energy: Definition of terms, Work Energy principles, Conservation of Mechanical Energy, simple numerical problems.

Unit– V Friction and Simple Lifting Machine

Friction: Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between coefficient of friction and angle of friction, equilibrium of bodies on level surface subjected to force parallel and inclined to plane, equilibrium of bodies on inclined plane subjected to force parallel to the plane only.

Simple lifting machine: Simple lifting machine, load, effort, mechanical advantage, applications and advantages, velocity ratio, efficiency of machines, law of machine, Ideal machine, friction in machine, maximum mechanical advantage and efficiency, reversible and non-reversible machines, conditions for reversibility, velocity ratios of Simple axle and wheel, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block.

References:

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi(2008)

2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. NewDelhi.
3. Bansal RK, A text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. NewDelhi.
5. Ram, H. D.; Chauhan, A. K., Foundations and Applications of Applied Mechanics, Cambridge University Press.
6. Meriam, J.L.,Kraige, L.G., Engineering Mechanics-Statics, Vol. I, Wiley Publication, New Delhi.
7. Upadhay A.K, Applied Mechanics, S.K. Kataria & Sons, New Delhi

Course Outcomes:

After completing this course, student will be able to:

CO 1	Determine unknown forces and support reactions of different engineering systems.
CO 2	Find the centroid, centre of gravity and moment of inertia of various components in engineering systems.
CO 3	Apply work, power, energy concept to solve rectilinear and circular motion problems
CO 4	Apply the principles of friction in various conditions for useful purposes.
CO 5	Select the relevant simple lifting machine(s) for given purposes.

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Course Code	:	CEBS 102
Course Title	:	Applied Chemistry
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives

- To understand atomic structure concepts (Rutherford's model, Bohr's theory, quantum numbers) and chemical bonding (ionic, covalent, coordination); to study molecular structures (H_2O, NH_3, CH_4) and concentration methods (molarity, normality, mole fraction).
- To explore water hardness and its effects on industrial processes; to learn methods for determining hardness and water-softening techniques (soda lime, zeolite, ion exchange); to examine municipal water treatment and drinking water standards.
- To study metal extraction and iron-based materials (cast iron, steel); to understand heat treatment and alloys (brass, bronze, duralumin); to learn about polymers (types, preparation, applications).
- To classify and analyze the combustion of fuels, to calculate calorific values, and to study the properties of fuels (LPG, CNG); to learn about lubricants' physical and chemical properties.
- To understand the principles of electrochemistry, including oxidation-reduction reactions and corrosion types; to learn methods for preventing corrosion, such as design, alloying, cathodic protection, and coating.

Course Content:

Unit-1 Atomic Structure, Chemical Bonding and Solutions

- Rutherford model of atom, Bohr's theory, Quantum numbers – orbital concept. Shapes of *s,p* and *d* orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.
- Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond (H_2, F_2, HF, $BeCl_2$, BF_3, CH_4, NH_3, H_2O), coordination bond in NH_4^+.

- Solution – idea of solute, solvent and solution, methods to express the concentration of solution- molarity, normality, strength, ppm, mass percentage, volume percentage, mass by volume percentage and mole fraction.

Unit-2 Water

- Classification of soft and hard water, salts causing water hardness, unit of hardness and simple numerical on water hardness.
- Problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by EDTA method. Estimation of dissolved oxygen, free chlorine, chloride ion and alkalinity.
- Water softening techniques – soda lime process, zeolite process and ion exchange process. Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilisation. Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collecting data and understand standards).

Unit-3 Engineering Materials

- Natural occurrence of metals – minerals & ores of iron. Pig Iron, Cast iron, Steel and Heat treatment of steal.
- Alloys – definition, purposes of alloying. Composition, properties and uses of Brass, Bronze, Gun metal, Invar and Duralumin.
- Polymers – monomer, homo and co polymers, simple reactions involved in preparation and their application of thermoplastics and thermosetting polymers (PVC, PS, PTFE, nylon–6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

Unit-4 Chemistry of Fuels and Lubricants

- Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV). Calculation of HCV and LCV using Dulong's formula. Fractional distillation of crude petroleum, octane number and cetane number.
- Chemical composition, calorific values and applications of LPG, CNG, Water gas, Coal gas and Producer gas.

- Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point, cloud and pour point) and chemical properties of lubricant (acid number, saponification value).

Unit-5 Electro Chemistry

- Electronic concept of oxidation, reduction and redox reactions. Definition of terms: electrolytes, non-electrolytes with suitable examples.
- Introduction to Corrosion of metals: Definition, types of corrosion: Chemical and Electrochemical corrosion, Galvanic corrosion, Concentration corrosion, Pitting corrosion and Stress corrosion.
- Protection of corrosion by Proper designing, Alloying, Cathodic and anodic protection and Coating methods.

References

1. Anju Rawlley&Devdatta Vinayakrao Saraf, Applied Chemistry (with lab manual), Khanna Book Publishing Co. (P) Ltd. Delhi.
2. Chemistry for Class XI& XII (Part-I, Part-II), N.C.E.R.T., Delhi.
3. Agarwal, & Shikha, Engineering Chemistry,Cambridge University Press, New Delhi.
4. C.N. R. Rao, Understanding Chemistry,Universities Press (India) Pvt. Ltd.
5. Dara, S. S. &S.S.Umare,Engineering Chemistry, S.Chand. Publication, New Delhi.
6. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons, New Delhi.
7. S. Vairam, Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi.
8. Rajesh Agnihotri, Chemistry for Engineers, Wiley India Pvt. Ltd.
9. Laboratory Manual Chemistry (Class XI and Class XII), NCERT.
10. G. H. Hugar & A. N. Pathak, Applied Chemistry Laboratory Practices(Vol. I and Vol. II), NITTTR Publications, Chandigarh.

Course Outcomes:

The students will be able to:

CO1	Explain atomic models, describe the concept of quantum numbers, and predict the shape and properties of molecules based on different types of chemical bonding, including ionic, covalent, and coordination bonds, as well as calculate the concentration of solutions using various methods.
CO2	Classify water as hard or soft, understand the causes of water hardness, calculate water hardness, and describe methods of water softening and municipal water treatment processes, while adhering to Indian standards for drinking water.
CO3	Identify the natural occurrence of metals, understand the properties and uses of alloys like brass, bronze, and duralumin, and explain the characteristics and applications of polymers, including thermoplastics, thermosetting plastics, and rubber.
CO4	Classify fuels based on their combustion properties, calculate calorific values using Dulong's formula, and describe the types of lubrication, the properties of lubricants, and their functions in industrial applications.
CO5	Explain redox reactions, differentiate between electrolytes and non-electrolytes, identify types of corrosion, and outline methods for preventing corrosion in metals.

Course Code	:	MEES 103
Course Title	:	Fundamentals of Mechanical Engineering
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To demonstrate the safety care and precautions in various mechanical shops, while working with tools and machines.
- To understand working principles of lathe operations and power transmission.
- To understand laws of thermodynamics and heat transfer Processes.
- To understand the working principles of heat engines
- To understand working principles of power developing and power absorbing devices

Course Content:

UNIT-I INTRODUCTION TO MECHANICAL SHOPS:

Introduction, safety, care and precaution in workshop, Material, operations & tools used in carpentry shop, fitting shop, smithy shop, Welding Shop, Principle of operation of Arc welding and gas welding, tools and equipment used in arc and gas welding, soldering and brazing.

UNIT-II LATHE & ITS OPERATIONS:

Introduction, Function of various parts of a lathe, Classification and specification of various types of lathe, Lathe operations - Plain and step turning, facing, taper turning, drilling, reaming, boring, threading and knurling, Milling Machine, Shaper and Planer Machines, Drilling Machine, Grinding Machine

Modes of Power Transmission: Transmission of Power through belt: flat belt V belt open belt and cross belt device, Derivation of tension ratio for flat belt, power transmission through chain and gears, Spur, Helical, Bevel, Rack and Pinion

UNIT-III BASIC THERMODYNAMICS:

Fundamental concept of Thermodynamics: Introduction, Define Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle, Elementary introduction to Zeroth, First and Second laws of thermodynamics, Practical application of thermodynamics.

Steam boiler: Introduction, classification, boiler accessories and mountings, construction and working of Cochran boiler, Babcock & Wilcox boiler

Steam turbine: Impulse and Reaction Turbines

UNIT-IV HEAT ENGINES:

Heat Engines: Introduction, classifications, Components of IC engines, Cylinder, crankcase, crankpin, crank, crankshaft, connecting rod, wrist pin, piston, cooling pins cylinder heads, exhaust valve, inlet valve; Working of four-stroke and two-stroke petrol and diesel engines; Comparison of two stroke and four stroke engines; Comparison of C. I. and S. I. engines

UNIT-V THERMAL & FLUID SYSTEMS:

Refrigeration and Air Conditioning System: Introduction and applications, Ton of refrigeration (TR), coefficient of performance, vapour compression cycle, vapour absorption cycle, Window air conditioner

Pumps: working principle of Reciprocating and centrifugal pump

Air compressor: working principle of rotary air compressor (root blower, vane blower), Fluid systems: Working principle of hydraulic jack, hydraulic lift, hydraulic coupling

References:

1. M.P. Poonia& S.C. Sharma, Basic Mechanical Engineering, Khanna Pub. House, Delhi
2. M. L. Mathur, F. S. Mehta and R. P. Tiwari, Elements of Mechanical Engineering, Jain Brothers, New Delhi
3. B. S. Raghuvanshi, Workshop Technology (Vol.1 & 2), DhanpathRai and Sons, New Delhi.
4. J. Benjamin, Textbook of Basic Mechanical Engineering, Publisher: Kollam : Pentex
5. Roy Chaudhary, Basic Engineering Thermodynamic. Tata McGraw Hill, Delhi.

Course Outcomes:

The student will be able to:

CO1	Identify tools used in various mechanical workshops
CO2	Understand functions and operations of machine tools including milling, shaping, grinding and lathe machines and mode of power transmission in machines
CO3	Explain laws of thermodynamics and its practical application of thermodynamics
CO4	Illustrate various parts of internal combustion engine
CO5	Understand basics of pump, compressor and refrigeration and air-conditioning systems

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Course Code:	:	ECES 104
Course Title	:	Fundamentals of Electronics Engineering
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To get the ideas about the applications of electronics engineering in different fields of life.
- To gain in-depth knowledge of p-n junction diode and its applications in electronic switching and rectifier circuits.
- To explore the idea of electronic filtration process by using various filter circuits.
- To gain knowledge about the zener diode and its application in voltage regulator.
- To get familiarized with bipolar junction transistor and its applications in electronic switching and amplifier circuits.

Course Content:

Unit-I

PN Junction Diode:

PN Junction diode, Depletion layer, Potential barrier, Behavior of P-N junction diode under forward and reverse bias, Cut-in voltage, Reverse saturation current, V-I characteristics, Breakdown phenomenon, Static and dynamic resistance and their calculations from diode characteristics, Dynamic resistance of the diode in terms of diode current, Diode ratings and specifications.

Unit-II

Rectifiers and Filters:

Rectifier circuits, Principle of operation and output waveforms of half wave rectifier, centre tapped and bridge type rectifier, Average value and RMS value of output voltage and load current, Performance analysis of rectifier circuits: ripple factor and rectification efficiency, Filter circuits,

Shunt capacitor filter, Series inductor filter, L-type and pie type filter, Physical explanation of working of the shunt capacitor and series inductor filter and their suitability.

Unit-III

Special Purpose Diodes:

Zener diode: construction and operation, zener and avalanche breakdown mechanism, V-I characteristics, Zener ratings: zener voltage, minimum zener current, maximum zener current, maximum zener power dissipation and zener resistance, Application of Zener diode in voltage regulator circuit, Brief description with V-I characteristics and applications of varactor diode and light emitting diode.

Unit-IV

Bipolar Junction Transistor:

Concept of bipolar junction transistor as a two junction three terminal device, NPN and PNP transistor, Principle of operation of transistor, Transistor current relation, Different configurations: CB, CE, and CC, concept of leakage current and effect of temperature on it, input and output characteristics, Determination of input, output dynamic resistances and current amplification factor from the characteristics, Comparison of the three configurations.

Unit-V

Amplifier and Biasing Circuits:

Transistor as an amplifier in CE configuration, DC equivalent circuit, DC load line and operating point, Factors affecting operating point, Thermal runway condition of transistor, Effect of fixing operating point in cut off and saturation region, Different biasing circuits: Fixed biasing, collector to base biasing, potential divider biasing and emitter biasing circuit, Calculation of operating point for these biasing circuits, Merits and demerits.

References:

1. N. N. Bhargava, D. C. Kulshrestha, S. C. Gupta, Basic Electronics and Linear Circuits, Tata McGraw-Hill Publishing Company Limited, New Delhi.

2. V. K. Mehta, Rohit Mehta, Principles of Electronics, S. Chand and Company, New Delhi.

3. Albert Malvino, David Paul, Electronics Principles, McGraw Hill Education, New Delhi.

4. R. S. Sedha, A Text Book of Applied Electronics, S. Chand and Company, New Delhi.

5. David Bell, Fundamental of Electronic Devices and Circuits, Oxford University Press.

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Explain the construction, working and characteristics of p-n junction diodes.
CO2	Gain knowledge about the rectifier and filter circuits in converting ac signal into smooth dc signal.
CO3	Develop the ability to understand the application of zener diode in voltage regulator circuit.
CO4	Gain in-depth knowledge about the construction, working and characteristics of bipolar junction transistor.
CO5	To understand the applications of bipolar junction transistor in switching and amplification.

Course Code	:	CEBS 105
Course Title	:	Applied Mathematics - I
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives

- Develop foundational knowledge of trigonometry
- Strengthen understanding of algebraic concepts
- Enhance combinatorial and theoretical skills
- Introduce determinants and matrices for problem-solving
- Explore and apply complex numbers

Course Contents

Unit-1: Trigonometry

Grades, radians and their conversions, Trigonometrical ratios of allied angles (without proof), sum, difference formulae and their applications (without proof). Product formulae (transformation of product to sum, differences and vice-versa). Trigonometrical ratios of multiple and sub-multiple angles, Statement of cosine formula, sine formula, Napier's, half angle formula and Heron's formula.

Unit-2: Algebra

Sequences and series: Arithmetic progression, its nth term, sum to n terms. Geometric progression, its n^{th} term, sum to n terms and sum of infinite terms, Finite sum of squares and cubes of natural numbers.

Partial fraction: Definition of polynomial fraction and partial fractions, proper and improper fraction. To resolve proper fraction into partial fraction with denominator containing non-repeated linear factors, repeated linear factor and irreducible non-repeated quadratic factors.

Unit-3: Combinatory and Binomial Theorem

Permutations and Combinations: Basic Counting techniques, Value of P (n, r) and C (n, r), and their applications.

Binomial Theorem: Binomial theorem (without proof) for positive integral index (expansion, general term, and middle term). Binomial theorem (without proof) for any index (expansion and general term), Binomial approximation of first and second-degree terms.

Unit-4: Determinants and Matrices

Matrices : Definition and examples of matrices, types of matrices, Basic operations, Equality of matrices, addition, multiplication of two matrices, scalar multiplication of a matrix, Transpose of a matrix, symmetric, skew-symmetric matrices, singular and non-singular matrices, cofactor matrix, adjoint of a matrix, inverse of a matrix,

Determinants: Determinants (up to 3rd order only), minors, co-factors, Properties of determinants, Solution of linear simultaneous equations in three variables by Cramer's rule and matrix inverse methods.

Unit-5: Complex Numbers

Modulus and amplitude of a complex number, Conjugate of a complex number, Polar and cartesian representation of a complex number and its conversion from one form to other, Operations on complex numbers, De-Moiver's theorem and its application, cube roots and n-th roots of unity.

References

1. H.K. Dass, Rama Verma & Rajnish Verma,Mathematics for Polytechnics, CBS Publishers.
2. R.D. Sharma,Applied Mathematics,DhanPat Rai Publications.
3. Deepak Singh, Mathematics-I, Khanna Book Publishing Co. (P) Ltd.
4. Garima Singh, Mathematics-II, Khanna Book Publishing Co. (P) Ltd.

Course Outcomes

The students will be able to:

CO1	Apply trigonometric identities and formulas to solve problems involving angles, including those related to sum, difference, product, multiple, and sub-multiple angles.
CO2	Solve problems involving sequences and series, including arithmetic progression, geometric progression, and partial fractions, to analyze and simplify expressions.
CO3	Apply the principles of permutations and combinations to solve counting problems and use the binomial theorem for expansion and approximations.
CO4	Use matrices and determinants to solve systems of linear equations, perform matrix operations, and understand key properties and types of matrices.
CO5	Perform operations on complex numbers in both polar and Cartesian forms and apply De Moivre's theorem to solve problems involving powers and roots of complex numbers.

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Course Code	:	CEES 111
Course Title	:	Engineering Mechanics Lab.
Number of Credits	:	1 (L:0,T:0,P:2)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

Following are the objectives of this course:

- To obtain resultant of various forces calculate support reactions through conditions of equilibrium for various structures
- To understand role of friction in equilibrium problems
- To know fundamental laws of machines and their applications to various engineering problems

List of Practical: (Minimum 10 experiments to be performed)

1. To find the M.A., V.R., Efficiency and law of machine for Differential Axle and Wheel.
2. To find the M.A., V.R., Efficiency and law of machine for Simple Screw Jack.
3. Derive Law of machine using Worm and worm wheel.
4. Derive Law of machine using Single purchase crab.
5. Derive Law of machine using double purchase crab.
6. Derive Law of machine using Weston's differential or wormed geared pulley block.
7. Determine resultant of concurrent forces by Y-stem applying Law of Polygon of forces using force table.
8. Determine resultant of concurrent forces by Y-stem graphically.
9. Determine resultant of parallel forces by Y-stem graphically.
10. Verify Lami's theorem.
11. Study forces in various members of Jib crane.
12. Determine support reactions for simply supported beam.
13. Obtain support reactions of beam using graphical method.
14. Determine coefficient of friction for motion on horizontal and inclined plane.
15. Determine centroid of geometrical plane figures.

References:

1. Bedi D.S., Engineering Mechanics, Khanna Publishing House
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal RK, A text book of Engineering Mechanics, Laxmi Publications.

4. Ramamrutham, Engineering Mechanics, S., S Chand & Co. New Delhi.
5. Ram, H.D.; Chauhan, A.K. Foundations and Applications of Applied Mechanics, Cambridge University Press.

Course Outcomes:

After completing this course, student will be able to

CO 1	Determine unknown force(s) of different engineering systems.
CO 2	Apply the principles of friction in various conditions for useful purposes.
CO 3	Select the relevant simple lifting machine(s) for given purposes.

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Course Code	:	CEBS 112
Course Title	:	Applied Chemistry Lab
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives:

- **Quantitative Chemical Analysis**:
  Students will perform chemical analyses to determine the purity of oxalic acid, analyze NaOH and KOH mixtures, and estimate various water quality parameters such as hardness, chloride ions, free chlorine, dissolved oxygen, and alkalinity.
- **Water Hardness and Quality Assessment**:
  Students will estimate temporary, permanent, and total water hardness using the EDTA method and assess water quality by measuring chloride ions, free chlorine, and dissolved oxygen.
- **Physical Property Measurements**:
  Students will determine the viscosity of lubricating oils using the Redwood Viscometer and estimate the moisture content in coal samples.

Course Content:

1. To determine the purity percentage of oxalic acid in a given impure mixture.
2. To analyse a mixture of NaOH and KOH (given a solution contacting 2.5g mixture of NaOH and KOH per litre).
3. To estimate the calcium and magnesium hardness in the given water sample.
4. To estimate the Chloride ion (Cl^-) in the given water sample.
5. To estimate the free Chlorine (Cl_2) in the given water sample.
6. To estimate the dissolved Oxygen (D.O) in the given water sample.
7. To estimate the Alkalinity in the given water sample.
8. To estimate the temporary, permanent and total hardness in the given water sample by EDTA method.
9. To determine the viscosity of a lubricating oil by Redwood Viscometer.
10. To determine the moisture percentage in a coal sample.

References

1. Anju Rawlley& Devdatta Vinayakrao Saraf,Applied Chemistry (with lab manual), Khanna Book Publishing Co. (P) Ltd. Delhi.
2. Laboratory Manual Chemistry (Class XI and Class XII), NCERT.
3. G. H. Hugar & A. N. Pathak, Applied Chemistry Laboratory Practices (Vol. I and Vol. II), NITTTR Publications, Chandigarh.

Course Outcomes

The students will be able to:

CO1	Recall and explain the principles and methods used in the quantitative analysis of chemical substances, including the estimation of purity, hardness, chloride ions, and dissolved oxygen in water samples.
CO2	Demonstrate the ability to apply appropriate analytical techniques, such as titration and viscosity measurement, to determine chemical concentrations and physical properties in various samples, including water, lubricants, and coal.
CO3	Analyse experimental data, evaluate the results for accuracy and precision, and assess the impact of different factors (e.g., impurities, water quality) on the outcomes of chemical and physical measurements.

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Course Code:	:	ECES 114
Course Title	:	Fundamentals of Electronics Engineering Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To develop understanding of characteristics of p-n junction, zener and light emitting diode in different biasing conditions.
- To analyze the performance of various rectifiers without and with different filter circuits.
- To plot input and output characteristics curves for common base and common emitter bipolar junction transistor.

List of Experiments:

1. To draw V-I characteristics of p-n junction diode and to calculate its static and dynamic resistances in forward and reverse bias conditions.
2. To draw V-I characteristics of zener diode and to calculate its static and dynamic resistances in forward and reverse bias conditions.
3. To draw V-I characteristics of light emitting diode and to calculate its static and dynamic resistances in forward and reverse bias conditions.
4. To calculate ripple factor for half wave rectifier without filter and with filters.
5. To calculate ripple factor for centre-tap full wave rectifier without filter and with filters.
6. To calculate ripple factor for bridge type full wave rectifier without filter and with filters.
7. To draw input characteristics for common base transistor and to calculate its static and dynamic resistances.
8. To draw output characteristics for common base transistor and to calculate its static and dynamic resistances.
9. To draw input characteristics for common emitter transistor and to calculate its static and dynamic resistances.
10. To draw output characteristics for common emitter transistor and to calculate its static and dynamic resistances.

Course Outcomes:

At the end of the course, the student will be able to:

CO1	To calculate static and dynamic resistance of various semiconductor diodes in forward and reverse bias conditions.
CO2	To measure and calculate the ripple factor produced by various rectifiers without and with different filter circuits.
CO3	To compute static and dynamic input and output resistances of bipolar junction transistor.

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Course Code	:	MEES 116
Course Title	:	Engineering Workshop Practice
Number of Credits	:	2 (L: 0 T: 0 P: 4)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To understand the use of different tools, equipment and safety precaution in the workshops.
- To understand, identify, select and use various marking, measuring, and holding, striking and cutting tools and equipment
- To understand and interpret job drawings, produce jobs, and acquire skills to operate inspect the job for specified dimensions

Course Content:

Sr. No.	Details of Practical Content
1	**Carpentry Shop:** • Safety Precautions to be served in the shop • Demonstration of different wood working tools/machines and different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc. • One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.
2	**Fitting Shop:** • Safety Precautions to be served in the shop • Demonstration of different fitting tools different operations like chipping, filing, drilling, tapping, sawing, cutting etc. • One simple fitting job involving practice of above operations
3	**Welding Shop:** • Safety Precautions to be served in the shop • Demonstration of different welding tools / machines, and arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding • One simple job involving butt and lap joint
4	**Sheet Metal shop:** • Safety Precautions to be served in the shop • Demonstration of different sheet metal tools / machines • Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting • One simple job involving sheet metal operations and soldering and riveting.

5	**Smithy Shop:** • Safety Precautions to be served in the shop • Demonstration and detailed explanation of tools, equipment used • One simple job involving operation of forging a square headed bolt.
6	**Machine Shop:** • Safety Precautions to be served in the shop • Study and sketch of lathe machine, bench grinder, milling machine, drilling machine. • Study of various operations on lathe machine such as turning, step turning, taper turning, facing, andknurling.

References:

1. B.S. Raghuwanshi, Workshop Technology, DhanpatRai and sons, New Delhi 2014
2. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
3. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York
4. S.K. HajaraChaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015
5. H S Bawa, Mechanical Workshop Practice, McGraw Hill Education

Course Outcomes:

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

CO1	Acquire practical skills of using various marking, measuring, holding, striking and cutting tools & equipment and machines
CO2	Understand job drawing, job material and complete jobs as per specifications in allotted time
CO3	Operate, control different machines and equipment adopting safety practices

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Course Code	:	CEHS 117
Course Title	:	Sports and Yoga Lab
Number of Credits	:	1 (L:0 T:0 P:2)
Prerequisites	:	NIL
Course Category	:	HS

Course Objectives:

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
- To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury.

Course Content:

• **Introduction to Physical Education**
  - o Meaning & definition of Physical Education
  - o Aims & Objectives of Physical Education
  - o Changing trends in Physical Education

• **Olympic Movement**
  - o Ancient & Modern Olympics (Summer & Winter)
  - o Olympic Symbols, Ideals, Objectives & Values
  - o Awards and Honours in the field of Sports in India (Dronacharya Award, ArjunaAward, Dhayanchand Award, Rajiv Gandhi KhelRatna Award etc.)

• **Physical Fitness, Wellness & Lifestyle**
  - o Meaning & Importance of Physical Fitness & Wellness
  - o Components of Physical fitness
  - o Components of Health-related fitness
  - o Components of wellness
  - o Preventing Health Threats through Lifestyle Change
  - o Concept of Positive Lifestyle

• **Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga**
  - o Define Anatomy, Physiology & Its Importance
  - o Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

• **Kinesiology, Biomechanics & Sports**
  - o Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
  - o Newton's Law of Motion & its application in sports.
  - o Friction and its effects in Sports.

• **Postures**

- o Meaning and Concept of Postures.
- o Causes of Bad Posture.
- o Advantages & disadvantages of weight training.
- o Concept & advantages of Correct Posture.
- o Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
- o Corrective Measures for Postural Deformities

- **Yoga**
  - o Meaning & Importance of Yoga
  - o Elements of Yoga
  - o Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
  - o Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana&Sha-shankasana)
  - o Relaxation Techniques for improving concentration - Yog-nidra.
- **Yoga & Lifestyle**
  - oAsanas as preventive measures.
  - o Hypertension: Tadasana, Vajrasana, PavanMuktasana, ArdhaChakrasana, Bhujangasana, Sharasana.
  - o Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, ArdhMatsyendrasana.
  - o Back Pain: Tadasana, ArdhMatsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
  - o Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, PavanMuktasana, ArdhMatsyendrasana.
  - oAsthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.
- **Training and Planning in Sports**
  - o Meaning of Training
  - o Warming up and limbering down
  - o Skill, Technique & Style
  - o Meaning and Objectives of Planning.
  - o Tournament – Knock-Out, League/Round Robin & Combination.
- **Psychology & Sports**
  - o Definition & Importance of Psychology in Physical Edu. & Sports
  - o Define & Differentiate Between Growth & Development
  - o Adolescent Problems & Their Management
  - o Emotion: Concept, Type & Controlling of emotions
  - o Meaning, Concept & Types of Aggressions in Sports.
  - oPsychological benefits of exercise.
  - o Anxiety & Fear and its effects on Sports Performance.
  - o Motivation, its type & techniques.
- **Doping**
  - o Meaning and Concept of Doping
  - o Prohibited Substances & Methods

- Side Effects of Prohibited Substances

• **Sports Medicine**

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention.
- Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

• **Sports / Games**

Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

- History of the Game/Sport.
- Latest General Rules of the Game/Sport.
- Specifications of Play Fields and Related Sports Equipment.
- Important Tournaments and Venues.
- Sports Personalities.
- Proper Sports Gear and its Importance.

References:

1. Prof. Ajmer Singh, Modern Trends and Physical Education.
2. L B.K.S. Iyengar, ight on Yoga
3. Health and Physical Education – NCERT (11th and 12th Classes)

Course Outcomes:

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

CO1	Improve personal fitness and develop understanding of health fitness and psychological problems associated with the age and lifestyle
CO2	Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
CO3	Understand basic skills associated with yoga and physical activities and perform yoga movements in various combination and forms.

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Course Code	:	CEHS 201
Course Title	:	Communication Skills
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	NIL
Course Category	:	HS

Course Objectives

- To develop confidence and proficiency in spoken English with correct pronunciation, while strengthening the four key communication skills.
- To enhance public speaking, group discussions and presentation skills, enabling students to express their ideas effectively, and succeed academically,professionally and socially.
- To foster personality development by cultivating self-confidence, adaptability, emotional intelligence and resilience.
- To strengthen leadership and teamwork abilities through collaboration, efficient team management and proactive decision-making.
- To align communication and interpersonal skills with professional ethics and career aspirations and goals for long-term success.

Course Content

Unit 1:Basics of Communication Skills in English

- Introduction to Communication: Meaning, definition and process of communication.
- Types of Communication: Formal and informal; verbal, non-verbal and written.
- Barriers to Effective Communication: Physical, linguistic, psychological, cultural, organisational, semantic and technical barriers.
- 7 Cs of Effective Communication: Considerate, Concrete, Concise, Clear, Complete, Correct, Courteous.
- Art of Effective Communication: Choosing words, voice modulation, clarity, time management and simplification of words.
- Technical Communication.

Unit 2: Soft Skills and Life Skills for Personal Excellence

- **Soft Skills**: Personal attributes and interpersonal abilities that enhance job performance and career prospects and interpersonal interactions. Soft skills help build effective relationships, clear communication and adaptability in professional environments.
- **Life Skills: T**ools for managing personal and professional challenges, developing self-awareness and self-analysis, understanding one's strengths and weaknesses. Life skills also encompass adaptability with a positive attitude, resilience to overcome setbacks and stress; emotional intelligence to recognise, understand and manage one's emotions while responding to others, and empathy which promotes better relationships by understanding and sharing others' feelings.

Unit 3: Reading Comprehension

Comprehension, Vocabulary Enrichment, Grammar Exercises based on reading of the following texts:

Section-1 (Stories)

- Sparrows by K. A. Abbas
- The Gift of the Magi by O. Henry
- The Happy Prince by Oscar Wilde
- Games at Twilight by Anita Desai

Section-2 (Poems)

- Night of the Scorpion by Nissim Ezekiel
- Stopping by Woods on a Snowy Evening by Robert Frost
- Where the Mind is Without Fear by Rabindranath Tagore
- My Mother at Sixty Six by Kamla Das

Unit-4: Professional Writing

- The Art of Paragraph Writing
- Letters: Business and Personnel
- Drafting notices, minutes of a meeting, etc.

Unit-5: Vocabulary and Grammar

- Commonly used words: Word Meaning and Usage, Synonyms and Antonyms, Dictionary skills, Contextual Vocabulary
- Glossary of Official Correspondence
- One-word substitution, Idioms and Phrases
- Tenses and Verbs Usage (Through Translation between English and Hindi)
- Transformation of sentences: Interchange of Degrees of Comparison, Active and Passive Voice, Direct and Indirect Speech
- Common errors: Grammatical errors, Pronunciation errors, Vocabulary errors, Wrong use of Idiomatic Expressions, etc.

References:

1. O'Connor, J. D. Better English Pronunciation. Cambridge University Press
2. Murray, Lindley. An English Grammar: Comprehending Principles and Rules. Wilson and Sons
3. Tiwari, Anjana. Communication Skills in English. Khanna Book Publishing Co. (P) Ltd.
4. Kumar, Kulbhushan. Effective Communication Skills. Khanna Publishing House
5. Maison, Margaret M. Examine Your English. Orient Longman
6. Rizvi, M. Ashraf. Effective Technical Communication. McGraw Hill
7. Nielson, John. Effective Communication Skills.Xlibris
8. Cambridge Advanced Learner's Dictionary. 4th ed., Cambridge University Press
9. Roget, Peter Mark**.** Roget's Thesaurus of English Words and Phrases. Edited by George Davidson, Penguin Books
10. Raman, Meenakshi, and Sangeeta Sharma. Technical Communication: Principles and Practice. 2nd ed., Oxford University Press
11. Swan, Michael. Practical English Usage. 4th ed., Oxford University Press
12. Balasubramanian, T. A Textbook of English Phonetics for Indian Students. Macmillan
13. Murphy, Raymond. Intermediate English Grammar. Cambridge University Press
14. https://wordpowermadeeasy.files.wordpress.com/2007/12/gre_wordlist.pdf

Course Outcomes:

The students will be able to:

CO1	Develop conceptual clarity on communication and its components, identify and overcome barriers to effective communication, apply the 7 Cs for clarity and precision; refine verbal and non-verbal skills through word choice, voice modulation and master technical communication for professional excellence.
CO2	Acquire essential soft and life skills to enhance personal and professional effectiveness, foster strong interpersonal relationships, cultivate adaptability and resilience, apply and

	demonstrate emotional intelligence and empathy for meaningful interactions and career success.
CO3	Enhance reading comprehension through diverse literary texts, enrich vocabulary, strengthen grammar and develop critical thinking and analytical skills for deeper textual interpretation. Foster a lifelong learning mindset, develop and promote empathy, resilience, cultural awareness and values such as patriotism, familial bonds, scientific attitude and self-awareness, logic and rationality.
CO4	Attain proficiency in professional writing by mastering paragraph structuring, composing effective business and personal letters and drafting formal documents such as notices and meeting minutes with clarity and precision.
CO5	Strengthen vocabulary and grammar skills through word usage, synonyms, antonyms, and contextual vocabulary, master official correspondence terminology, enhance accuracy in sentence transformation, tense usage and translation and rectify common errors in grammar, pronunciation and idiomatic expressions for effective communication.

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Course Code	:	CEBS 202
Course Title	:	Applied Physics
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives

- Develop a strong foundational understanding of concepts of physics.
- Utilize theoretical concepts to solve real-world physics problems.
- Improve analytical, mathematical and problem-solving skills in physics.
- Analyse physical phenomena and interpret the results.
- Introduce practical applications of physics in engineering and technology.

Course Content

Unit-1: Physical World, Units, and Measurements

Physical Quantities: Fundamental and derived units, Systems of units (FPS, CGS, SI).Dimensions: Dimensional formulae, principle of homogeneity, derivation of simple equations and correctness of physical equations.
Measurements: Least count, significant figures, error analysis and measuring instruments.

Unit-2: Vectors and Mechanics

Scalar and vector quantities: Addition and subtraction of vectors, scalar and vector product, resolution of vector.
Conservation of momentum, Work and energy, kinetic and potential energy, work-energy theorem.

Unit-3: Electromagnetism

Electric Field: Coulomb's law, electrostatic field, Gauss's law, and its applications (charged sheet, sphere etc.), electrostatic potential.
Capacitance: parallel plate capacitor, series and parallel combinations, energy stored in capacitor.
Electric Current: Resistance, Kirchhoff's laws and their applications.
Generation of Magnetic Field: Biot-Savart law, magnetic field due to current carrying straight wire and circular loop. Permanent magnets.
Effect of Magnetic Field: Force on current-carrying wires, torque on current-carrying loop.
Devices: Moving coil galvanometer and its conversion to ammeter and voltmeter.

Unit-4: Heat and Thermal properties:

Heat, modes of heat transfer, specific heat (C_p and C_v), Scales of temperature and thermometer, thermocouple and Seebeck effect. Thermal conductivity, thermal expansion, engineering applications

Unit-5: Waves and Optics

Simple Harmonic Motion: Time period, frequency, amplitude, transverse and longitudinal waves, superposition, principle of interference. Reflection and Refraction: Total internal reflection and its application in fiber optics. Lens formula, magnification, optical instruments: simple microscope, compound microscope and astronomical telescope. LASER and applications.

References

1. Physics Textbook for Class XI (Part 1 and Part 2) & XII (Part 1 and Part 2), NCERT.
2. David Halliday, Robert Resnick & Jearl Walker, Principles of Physics, John Wiley and Sons.
3. Vivek Talati & Vinod Kumar Yadav, Applied Physics-I (with Lab manual), Khanna Book Publishing Co. (P) Ltd.
4. Hussain Jeevakhan, Applied Physics-II (with lab manual), Khanna Book Publishing Co. (P) Ltd.
5. A Manual of Higher Secondary Physics Laboratory Kit, NCERT.
6. M. Mudassir Husain & M. Rafat, An Experience of Physics, Cadplan Publishers.
7. e-books/e-tools/learning physics software/YouTube videos/websites etc.

Course Outcomes

The students will be able to:

CO1	Identifydimensions of physical quantitiesand correctness of physical equations, use accurate units, apply rules of errors propagation and significant figures.
CO2	Perform vector operations and analyse vectors to apply them in the problems related to principles of mechanics.
CO3	State key concepts of electrostatics, current electricity andelectromagnetismand derive standard results and solve problems based on these concepts.
CO4	Demonstrate understanding of the concepts of heatand thermal propertiesandidentifytheir applications in real world scenarios.
CO5	Recall the fundamental principles of simple harmonic motion and wave motion and describe the working of optical devices along with their applications.

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Course Code	:	COES 203
Course Title	:	IT Systems and Computer Programming
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To understand the fundamentals of computers, information technology and data representation
- To analyze computer system based on hardware, software, and different types of memories
- To apply algorithms and flowchart for writing programs using C language
- To understand C programming using arrays and functions
- To apply structures and pointers for writing programs using C language

Course Content:

Unit 1: Information Technology System and Data Representation

Digital computer systems, Characteristics, Digital vs. Analog computer systems, History, Computer generations, Types of computers and their classifications, Application of computer in various fields, Types of Personal Computers (PC),PC setup and Basic Input Output System; Working knowledge of PC software including Word Processor; Introduction to Information Technology (IT), Components of an IT system: Hardware, Software, Networks, Data, People, and Processes; Data representation: Number systems, radix, decimal, binary, octal, hexadecimal, conversion, and Complements: 1's complement, 2's complement, 9's complement, and 10's complement.

Unit 2: Computer Hardware, Software, and Memories

Elements of computer hardware, CPU, I/O devices, storage and media used in PCs, Computer software: Types of software, System software, Application software, Introduction to Operating System (OS), Functions and types of OS, DOS commands, Memory system of a PC, Primary

memory, Random access memory, Read only memory, Secondary memory, Types of secondary Storage, Access mechanism of storage devices.

Unit 3: Elements of Algorithms and Programming in C

Computer languages, Generation of languages, Translators- Assemblers, Interpreters, Compilers, Algorithm, Pseudo-code, Flowcharts rules and symbols, Structured programming concepts, Introduction to 'C', importance of C, basic structure of a C program, constants, variables and data types, Operators and expressions, managing I/O operations, Control statement: 'IF' statement and its various forms, go to statement, for, while and do- while loops, Switch decision making statement.

Unit 4: Array and Functions

Introduction to array, array notation, storage and representation, manipulating array elements, using multidimensional arrays, Functions: Built-in and user defined functions and their applications; Use of built-in graphics functions to draw 2D objects.

Unit 5: Structures and Pointers

Introduction to structures, Purpose, and usage of structures, declaring structures, assigning of structures, Pointers: Introduction, Address operator, and Basic programs using pointers, File handling, sequential and random-access files, Memory allocation, Command line parameters.

References:

1. Thareja R., "Computers Fundamentals and Programming in C," Oxford University Press 3rd Edition, 2023, ISBN-10: 9354977898
2. Kanetkar Y., "Let Us C: Authentic Guide to C Programming Language," BPB Publications, 20th Edition, 2024, ISBN-10: 9355515510
3. Ram B. and Kumar S., "Computer Fundamentals: Architecture and Organization," New Age International Private Limited, 6th Edition, 2020, ISBN-10:9388818555

4. Balagurusamy E., “Computing Fundamentals and C Programming,” McGraw Hill Education,2nd Edition, 2017, ISBN-10: 9352604164

Course Outcomes:

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

CO-1	Explain about computer system, components of IT system and different ways of data representation
CO-2	Differentiate among computer hardware, computer software, and memories
CO-3	Write Cprograms based on algorithm and flowchart
CO-4	Implement algorithms using array and functions of C programming language
CO-5	Demonstrate the use of structures and pointers in C programming language

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Course Code	:	EEES 204
Course Title	:	Fundamentals of Electrical Engineering
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To provide basic knowledge of electric and magnetic quantities and their units.
- To teach the basic concepts of electric and magnetic circuits as well as their inter-relations.
- To learn the various electrical rules/laws/theorems to help students deal with electrical engineering applications in industrial processes of different fields.
- To understand the concepts of alternating current and voltage, impedance, and phase angle.
- To learn the construction and principle of different types of transformers and rotating machines.

Course Contents:

Unit I: Electric Circuits

Basic concepts of charge; Electrical quantities and their units, Ohm's law; Resistance, Resistances in series; Resistances in parallel; Kirchhoff's laws & their applications; Network theorems; Laws of resistance; Temperature coefficient of resistance; Grouping of cells; Numerical problems.

Unit-II: Electromagnetism

Introduction to electromagnetism; Magnetic field at the axis of a solenoid; Force on a current carrying conductor placed in the magnetic field; Force between two parallel current carrying conductors.

Faraday's laws of electromagnetic induction; Lenz's law; Dynamically and statically induced emfs; Self and mutual inductances; Coefficient of coupling; Simple numerical problems.

Unit III: Magnetic Circuits

Magnetic flux& flux density; Magnetizing force; Magneto motive force (MMF); Absolute and relative permeability; Reluctance; Series and parallel magnetic circuits; Ampere-turn calculations; Leakage flux; Leakage factor; Analogy between electric and magnetic circuits; Numerical problems.

Unit IV: A.C. Circuits

Concept of alternating current and voltage; Cycle; Frequency; Periodic time; Amplitude; Angular velocity; Average value; RMS value; Form factor; Peak factor ;Impedance; Phase angle; Mathematical and phasor representation of alternating emf and current; A.C. through pure

resistance, pure inductance & pure capacitance; Concept of conductance, susceptance & admittance; Power factor, A.C in R-L, R-C, R-L-C series and parallel circuits.

Unit V: Transformer and Rotating Machines

General construction and principle of different type of transformers; Emf equation and transformation ratio of transformers; Auto transformers; Construction and working principle of motors; Basic equations and characteristic of motors; B-H curve ;Concept of eddy current and hysteresis; Hysteresis loop; Eddy current and hysteresis losses.

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN: 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN: 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513

Course Outcomes:

At the end of the course, the student will be able to:

1.	Analyze electric circuits using Ohm's law, Kirchhoff's laws, and network theorems.
2.	Understand the fundamental principles of electromagnetism, including electromagnetic induction and magnetic forces.
3.	Design and analyze magnetic circuits, including magnetizing force, reluctance, and permeability.
4.	Analyze and design AC circuits, including impedance, phase angle, and power factor.
5.	Understand the construction, principle, and operation of transformers and rotating machines.

Course Code	:	CEBS 205
Course Title	:	Applied Mathematics – II
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	Applied Mathematics – I (CEBS 105)
Course Category	:	BS

Course Objectives

- Develop mathematical foundations
- Explore advanced problem-solving techniques
- Understand and apply geometrical and analytical Concepts
- Develop the ability to solve first- and second-order differential equations
- Enhance computational skills in vectors

Course Contents

Unit-1: Differential Calculus

Concept of limits and continuity (without problems), Four standard limits: $\lim_{n\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, and $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$. Differentiation of functions by first principle, Differentiation of sum, difference, product and quotient of two functions, Differentiation of function of a function (Chain rule), Differentiation of trigonometric and inverse trigonometric functions, Logarithmic differentiation, Higher order derivatives (or successive differentiation).

Unit-2: Integral Calculus

Integration as inverse operation of differentiation, Simple integration by substitution**,** by parts and by partial fractions. Use of $\int_0^{\frac{\pi}{2}}\sin^m x\cos^n x\,dx$ for solving problems, where m and n are positive integers, Evaluation of definite integral. Properties of definite integral, area bounded by a curve between two ordinates and *x*-axis.

Unit-3: Co-ordinate Geometry of Two Dimensions

Definition of locus with problems, Equations of straight lines in various forms. Angle between two lines, Perpendicular distance formula, Study of properties of Circle, Parabola, Ellipse and Hyperbola.

Unit-4: Ordinary Differential Equations

Ordinary differential equation, Order and degree of differential equations, Solution of differential equations of first order and first degree, Variable separable, Homogeneous and Linear differential equations, Complementary function and Perticular integral of linear differential equations of 2nd order with constant coefficient.

Unit-5: Vectors

Scalars and vectors, addition and subtraction of vectors and their simple applications, multiplication of a vector by a scalar, Scalar and vector product of two vectors and their simple applications. Scalar product of three vectors and its geometrical interpretation.

References

1. H.K. Dass, Rama Verma & Rajnish Verma, Mathematics for Polytechnics, CBS Publishers.
2. R.D. Sharma, Applied Mathematics, DhanPat Rai Publications.
3. Deepak Singh, Mathematics-I, Khanna Book Publishing Co. (P) Ltd.
4. Garima Singh, Mathematics-II, Khanna Book Publishing Co. (P) Ltd.

Course Outcomes:

The students will be able to:

CO1	Use the concept of limits and differentiation to find derivatives of functions, including applications of sum, difference, product, quotient, chain rule, and differentiation of trigonometric, inverse trigonometric, and logarithmic functions.
CO2	Apply integration techniques such as substitution, integration by parts, and partial fractions to evaluate integrals, and understand the properties of definite integrals for finding areas and solving related problems.
CO3	Analyze and solve problems related to the equations of straight lines, conic sections, and loci, and apply the properties of geometric shapes like circles, parabolas, ellipses, and hyperbolas.
CO4	Formulate and solve ordinary differential equations of first and second order, including separable, homogeneous, and linear equations, and find complementary functions and particular integrals.
CO5	Understand and perform operations on vectors, including addition, subtraction, scalar multiplication, scalar and vector products, and apply these operations in geometric contexts and real-world applications.

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Course Code	:	CEHS 211
Course Title	:	Communication Skills Lab
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	HS

Course Objectives:

- To enhance listening, speaking and digital communication for professional and social interaction.
- To develop leadership, teamwork and public speaking for impactful presentations.
- To cultivate professional etiquette, cultural sensitivity and global awareness for diverse work environments.

Course Content:

Listening Skills – Enhancing Comprehension and Interpretation

- Introduction to active listening strategies, focusing on listening for main ideas, details and inferences.
- Practice with a variety of audio-visual materials such as recorded lectures, podcasts, interviews, TED talks, speeches and debates.
- Listening tests based on different accents, dialects and speech patterns to improve listening comprehension in diverse settings.
- Exercises to differentiate between tone, mood and intent in spoken language to strengthen interpretative skills.
- Focus on active listening and emotional regulation during interactions.

Phonetics and Pronunciation – Mastering Sounds for Clarity

- Study of the International Phonetic Alphabet (IPA) for accurate word transcription and pronunciation.
- Practice with consonants, vowels, diphthongs, stress patterns and weak forms to ensure precise and clear speech.
- Syllable division and understanding of stress patterns to enhance fluency and speech rhythm.
- Focus on intonation, voice modulation and pitch for effective communication and expressiveness.

- Techniques to improve accent reduction and pronunciation for clearer, more confident speech.

Speaking Skills – Effective Expression and Interaction

- Focus on formal and standard speech practices in various contexts: academic, business and public communication. Exercises to enhance self-awareness, adaptability and resilience in challenging communication situations.
- Development of oral presentation skills with emphasis on structure, clarity and audience engagement.
- Training in group discussions, debates and impromptu speaking to build confidence and articulation.
- Mock interviews and role-playing exercises to prepare students for real-world professional situations.
- Techniques for effective communication in business settings, including business presentations and public speaking engagements.
- Practice in conveying ideas clearly, assertively and persuasively in both individual and group settings.

Vocabulary Enhancement – Building Lexical Resource

- Construction of new words through affixes, prefixes and suffixes to enhance word formation skills.
- Extensive practice with phrasal verbs, idioms and foreign phrases to build fluency in diverse communication settings.
- Introduction to jargon and specialized vocabulary related to organisational structures, industries and professional settings.
- Development of contextual vocabulary for accurate and appropriate word choices in different settings (formal vs. informal, professional vs. casual).

Digital and Virtual Communication – Handling Online Platforms

- Techniques for effective communication in virtual settings, including webinars, video conferencing and digital presentations.
- Introduction to virtual communication etiquette: body language, tone and engagement in online meetings and webinars.
- Practice with writing and responding to professional emails, creating formal online presentations and using digital tools for effective communication.
- Developing skills to manage cross-cultural communication in global digital platforms.

- Developing empathy and emotional intelligence in communication for effective relationship-building.

References:

1. Anjana Tiwari, *Communication Skills in English.* Khanna Book Publishing Co. (P) Ltd. Delhi, 2022.
2. Jones, Daniel. *The Pronunciation of English.* Cambridge University Press, 1956.
3. Hartman, James, et al. *English Pronouncing Dictionary.* Cambridge University Press, 2006.
4. Kumar, Kulbhushan. *Effective Communication Skills.* Revised ed., Khanna Publishing House, 2018.
5. O'Connor, J. D. *Better English Pronunciation.* Cambridge University Press, 1980.
6. Murray, Lindley. *An English Grammar: Comprehending Principles and Rules.* Wilson and Sons, 1908.
7. Maison, Margaret M. *Examine Your English.* Orient Longman, 1964.
8. Sethi, J., et al. *A Practice Course in English Pronunciation.* Prentice Hall, 2004.
9. Pfeiffer, William Sanborn, and T. V. S. Padmaja. *Technical Communication: A Practical Approach.* 6th ed., Pearson, 2007.
10. Bansal, R. K., and J. B. Harrison. *Spoken English: A Manual of Speech and Phonetics.* Orient Blackswan, 2013.
11. https://wordpowermadeeasy.files.wordpress.com/2007/12/gre_wordlist.pdf

Course Outcome:

The students will be able to:

CO1	Apply active listening to understand key ideas, analyse speech patterns and interpret tone for effective communication, and master International Phonetic Alphabet, fine-tune pronunciation and enhance fluency, intonation and accent for confident speech.
CO2	Strengthen formal speech proficiency, improve presentations and build confidence through discussions, debates and role-plays; and expand vocabulary, develop fluency in idioms and phrasal verbs and refine word choice for effective formal and informal communication.
CO3	Excel virtual and cross-cultural communication, enhance non-verbal skills and adapt to diverse accents with personalised feedback; and cultivate emotional intelligence, resilience and adaptability for success in academic and professional settings.

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Course Code	:	CEBS212
Course Title	:	Applied Physics Lab
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives

- Value the importance of precise measurement and error analysis.
- Develop and enhance students' hands-on skills in measuring and recording of experiment data.
- Relate theoretical concepts of physics to real-world applications and engineering tasks.

List of Experiments:

1. To measure the volume of a cylinder using a Vernier caliper and calculate the associated uncertainty in the volume.
2. To measure the area of cross-section of a wire using a screw gauge and calculate the associated uncertainty in the area.
3. To determine radius of curvature of a spherical surface using spherometer
4. To determine the spring constant of helical spring using dynamic method.
5. Verification of Ohm's law.
6. Conversion of galvanometer into Ammeter/Voltmeter of desired range.
7. To determine focal length of a convex lens.
8. To determine temperature of room and hot bath using thermometer and convert the value into different scales.

References

1. M. Mudassir Husain & M. Rafat, An Experience of Physics, Cadplan Publishers.
2. A Manual of Higher Secondary Physics Laboratory Kit, NCERT.
3. Vivek Talati & Vinod Kumar Yadav, Applied Physics-I (with Lab manual), Khanna Book Publishing Co. (P) Ltd.
4. Hussain Jeevakhan, Applied Physics-II (with lab manual), Khanna Book Publishing Co. (P) Ltd.

Course Outcomes

The students will be able to:

CO1	Demonstrate a systematic approach to performing experiments, reporting results with significant figures and calculating experimental errors.
CO2	Measure volume, area of cross-section, radius of curvature, temperature, spring constant and focal length using appropriate instruments or methods and calculate the associated uncertainties.
CO3	Create an ammeter or a voltmeter using galvanometer and identify the relationship between current and voltage.

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Course Code	:	COES 213
Course Title	:	IT Systems and Computer Programming Lab
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

1. Understand the functionalities of various MS office tools such as Word, PowerPoint, and Excel, for document creation and presentations.
2. Apply C programming concepts such as decision-making, loops, and arrays for problem-solving.
3. Write C programs using functions, graphics, structures, and pointers to manipulate data and generate visual outputs.

List of Practicals / Programs

1. Identify various word options dialog and make your resume to showcase your skills and experience.
2. Make a question paper of applied mathematics of your course using equation editor of word.
3. Make a power point presentation to discuss the importance of IT systems and computer programming.
4. Design a spreadsheet using Excel to convert Celsius to Fahrenheit and Fahrenheit to Celsius.
5. Write an algorithm and program in C to check whether a given number is even or odd.
6. Write an algorithm and program in C to input marks of five subjects, i.e., Physics, Applied Mathematics, Information Technology, Digital Electronics, and Workshop; and compute the percentage as well as grade according to the following conditions: If percentage >= 90%: Grade A; If percentage >= 80%: Grade B; If percentage >= 70%:

Grade C; If percentage >= 60%: Grade D; If percentage >= 40%: Grade E; If percentage < 40%: Grade F (Failed). Modify this program using logical AND operator.

7. Draw a flowchart to print the multiplication table of a number entered by the users; also write a program for generating the multiplication table using different types of loops.
8. Write an algorithm and program in C to add "n" numbers using two- dimensional array.
9. Write a program in C using function to calculate the factorial of a given number.
10. Write a program in C to draw any two-dimensional object using built-in graphics functions.
11. Write a program in C using structure to store and display the information of a book.
12. Write a program in C using pointers to swap two numbers entered by the user.

Course Outcomes

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

CO-1	Design professional documents, presentations, and spreadsheets using MS office tools.
CO-2	Develop C programs using control structures, different types of loops, and arrays.
CO-3	Implement various types of problems using functions, structures, pointers, and graphics.

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Course Code	:	EEES 214
Course Title	:	Fundamentals of Electrical Engineering lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To verify Ohm's law and analyze series and parallel combinations of resistances in the circuit.
- To familiarize students with the measurement and analysis of active, reactive and apparent power in a single phase R-L, R-C and R-L-C series circuit, and to understand the concept of power factor using impedance triangle.
- To determine the permeability of a magnetic material by plotting B-H curve and analyze the transformation ratio of a single-phase transformer.

List of Experiments:

1. To verify the Ohm's law and draw its I-V characteristics.
2. To verify the relation $R_T = R_1 + R_2 + R_3 + \ldots\ldots\ldots + R_N$ in series combination of resistances.
3. To verify the relation $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots\ldots\ldots \frac{1}{R_N}$ in parallel combination of resistances.
4. To determine the permeability of magnetic material by plotting its B-H curve.
5. To measure the voltage, current and power in single phase R-L series circuit. Draw its voltage, impedance and power triangle.
6. To measure the voltage, current and power in single phase R-C series circuit. Draw its voltage, impedance and power triangle.
7. To measure the voltage, current and power in single phase R-L-C series circuit. Draw its voltage, impedance and power triangle.
8. To determine the transformation ratio of single phase transformer.

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Verify Ohm's law, series and parallel combinations of resistances.
CO2	Measure and calculate active, reactive and apparent power, impedance, and power factor in a single-phase R-L, R-C, and R-L-C series AC circuits.
CO3	Determine the permeability of a magnetic material and able to find the transformation ratio of a single-phase transformer.

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Course Code:	:	MEES 216
Course Title	:	Engineering Graphics
Number of Credits	:	2 (L: 0, T: 0, P: 4)
Prerequisites	:	NIL
Course Category	:	ES

Course Objectives:

- To understand the language of graphics which is used to express ideas, convey instructions while carrying out engineering jobs.
- To develop drafting and sketching skills, to know the applications of drawing equipment and get familiarize with Indian Standards related to engineering drawings.
- To develop skills to visualize actual object and to draw, read various engineering curves, projections, dimensioning styles, and understand common symbols used in engineering.

Course Content:

Introduction to Engineering Drawing:

Drawing Instruments and supporting materials, Sizes and layout of standard drawing sheets, Sizes of drawing boards, Method to use them with applications.

Lines:

Convention of lines and their applications, Different types of lines in engineering drawing as per BIS Specifications, Practice of vertical, horizontal and inclined lines.

Lettering:

Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75degrees, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4.

Dimensioning Techniques:

Necessity of dimensioning, Dimensioning techniques as per BIS (Board of Indian standard) SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning. Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches.

Scales:

Scales and their need and importance, type of scales, Representative Fractions – reduced, enlarged and full-size scales; Engineering Scales such as plain, diagonal scale and Vernier scale.

Geometrical Constructions:

Construction of ellipse, parabola and hyperbola by eccentricity method and other methods, cycloids, epicycloids and hypocycloids, regular polygons, involute.

Projections:

Introduction to projections. Basic concepts of projection techniques, projection of points and lines. Projection of Points in different quadrant, Projection of Straight Line (First angle and Third angle) Line parallel to both the planes, Line perpendicular to any one of the reference planes, Line inclined to any one of the reference planes.

Common Symbols and Conventions used in Engineering: Important Terms used in Building Drawing, Civil Engineering sanitary fitting symbols, Electrical fitting symbols for domestic interior installations.

S. No.	Practical Exercises
1	Draw horizontal, Vertical, 30-degree, 45 degrees, 60- and 75-degrees lines, different types of lines, dimensioning styles using Tee and Set squares/ drafter.
2	Letter writing single stroke and double stoke
3	Drawing of scales: plain, diagonal and vernier
4	Draw ellipse, parabola, and hyperbola by eccentricity method
5	Draw ellipse by arcs of a circle, oblong and concentric circle methods
6	Draw parabola and hyperbola using other methods
7	Draw regular polygons and involute
8	Draw various figures on projections of points
9	Draw some problems on projection of lines
10	Common symbols and conventions used in Engineering

References:

1. Bhatt, N. D. Engineering Drawing. Charotar Publishing House, Anand, Gujrat
2. P S Gill, Engineering Drawing, SK Kataria and sons. Delhi.
3. Jain &Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi Siddiquee, Arshad N., Khan, Zahid A., Ahmad, MukhtarEngineering Drawing With A Primer On Autocad, PHI Learning Pvt. Ltd.
4. Dhawan, R. K. Engineering Drawing. S. Chand and Company, New Delhi
5. Shah, P. J. Engineering Drawing. S. Chand and Company, New DelhiKulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. Engineering Graphics with AutoCAD. PHI Learning Private Limited-New Delhi
6. Jeyapoovan, T. Essentials of Engineering Drawing and Graphics using AutoCAD. Vikas Publishing House Pvt. Ltd, Noida,

Course Outcomes:

The student will be able to:

CO1	Draw lines and letter writing in single and double stroke
CO2	Select and construct appropriate drawing scales, use drawing equipment's, and understand Indian Standards of engineering drawing
CO3	Construct the various curves, draw views of given object and understand engineering convention used in drawing

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Course Code	:	CEAU 200
Course Title	:	Environmental Science
Number of Credits	:	0 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	AU

Course Objectives:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

- Solve various engineering problems applying ecosystem to produce eco – friendly products.
- Use relevant air and noise control method to solve domestic and industrial problems.
- Use relevant water and soil control method to solve domestic and industrial problems.
- To recognize relevant energy sources required for domestic and industrial applications.
- Solve local solid and e-waste problems.

Course Content:

Unit: I Ecosystem:

Structure of ecosystem, Biotic & Abiotic components Food chain and food web Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle.

Global warming -Causes, effects, process, Green House Effect, Ozone depletion

Unit: II Air and Noise Pollution:

Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)

Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)

Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler

Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

Unit: III Water and Soil Pollution:

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation

Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).

Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

Unit- IV Renewable Sources of Energy:

Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air), Theory of flat plate collector, Importance of coating. Advanced collector, Solar pond, Solar water heater, solar dryer. Solar stills.

Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism, Utilization and storage of biogas.

Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.

New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy.

Unit- V Solid Waste Management, ISO 14000 & Environmental Management

Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste.

Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.

Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste Air quality act 2004, air pollution control act 1981 and water pollution and control act1996.

Structure and role of Central and state pollution control board.

Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.

References:

1. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
2. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
3. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelh
4. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011
5. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
6. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
7. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)
8. www.eco-prayer.org

9. www.cpcp.nic.in
10. www.sustainabledevelopment.un.org

Courses Outcomes:

At the end of the course, the student will be able to:

CO1	Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products.
CO2	Explain the suitable air, extent of noise pollution, and control measures and acts
CO3	Observe the water and soil pollution, and control measures and acts
CO4	Distinguish different renewable energy resources and efficient process of harvesting.
CO5	Understand solid Waste Management, ISO 14000 & Environmental Management.

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Course Code	:	CEPC 301
Course Title	:	Basic Surveying
Number of Credits	:	2 (L:2, T:0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:
Following are the objectives of this course:

- To know the relative position of any object/ point on the earth
- To understand types of surveying works required.
- To know the types of method and equipments to be used for different surveys.
- To know the use and operational details of various surveying equipments.
- To understand a plan or map of a given area

Course Content:

Unit–I Overview and Classification of Survey

Purpose and use of surveying, Classification of surveying- Primary and Secondary, Division of surveying- Plane, Geodetic, Cadastral, Hydrographic, Photogrammetry and Aerial, principles of Surveying, Scales- Engineer's scale, Representative Fraction(RF) and diagonal scale.

Unit–II Chain Surveying

Instruments used in chain survey- Metric Chain, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, Optical square. Chain survey Station, Baseline, Check line, Tie line, Offset, Tie station, Ranging- Direct and Indirect Ranging, Methods of Chaining, obstacles in chaining, Errors in length- Instrumental error, personal error, error due to natural cause, random error, Principles of triangulation, types of offsets- perpendicular and oblique, Conventional Signs, Recording of measurements in a field book.

Unit–III Compass Traverse Survey

Compass Traversing- open, closed, Technical Terms-Geographic / True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system, examples on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing, calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination, Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings, Local attraction, Methods of correction of observed bearings- Correction at station and correction to included angles, Methods of plotting a traverse and closing error, Graphical adjustment of closing error.

Unit–IV Levelling and Contouring

Basic terminologies- Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments, Types of levels- Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary adjustments of Level, Types of Leveling Staff- Self reading staff and Target staff, Reduction of level by Height of collimation and Rise and Fall Method, Leveling Types-Simple, Differential, Fly, Profile, cross sectioning and Reciprocal Leveling, Difficulties in Leveling, Effect of earth curvature and refraction, Contour, contour intervals, horizontal equivalent, Uses of contour maps, Characteristics of contours, Methods of Contouring- Direct and indirect.

Unit–V Measurement of Area and Volume

Components and use of digital planimeter, measurement of area using numerical method and digital planimeter, measurement of volume of reservoir from contour map, numerical problems on area and volume calculation.

References:

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying-I, Laxmi Publications, New Delhi.
2. Arora K.R, Surveying Vol.-I, Standard Book House
3. Kanetkar, T.P.; Kulkarni, S.V., Surveying and Levelling volume-I, Pune Vidyarthi Gruh Prakashan.
4. Duggal, S.K., Survey-I, Mc Graw Hill Education, New Delhi.
5. Bhavikatti, S.S., Surveying and Levelling, Volume-1, I.K. International, New Delhi.

Course outcomes:

After completing this course, student will be able to:

CO 1	Use Surveying Instrument suitably and type of survey required for given situation.
CO 2	Compute area of open field using chain, tape and cross staff.
CO 3	Conduct traversing in the field using chain and compass.
CO 4	Use leveling instruments to determine reduced level for preparation of contour maps
CO 5	Calculate area and volume of a given site having irregular boundary

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Course Code	:	CEPC302
Course Title	:	Building Materials & Construction
Number of Credits	:	3 (L:3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:
Following are the objectives of this course:

- To know about natural, artificial, and processed materials available for various purposes of construction activities
- To know different component of building materials
- To learn about suitable type of foundation for building structures
- To be able to identify suitability of various materials for different construction purposes.
- To know finishes and importance of communications in buildings planning.

Course Content:

Unit–I Overview of Building Materials and Construction

Scope of construction materials in building construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only), Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy, Broad classification of materials Natural, Artificial, special, finishing and recycled.
Classification of Buildings as per National Building Code, types of constructions- Load bearing structure, Framed structure, Composite structure, Building components, functions of building components, Substructure–Foundation, Plinth, Superstructure– walls, partition wall, cavity wall, sill, lintel, doors and windows, floor, mezzanine floor, roof, columns, beams, Parapet.

Unit–II Natural and Artificial Construction Materials

Requirements of good building **stone**, general characteristics of stone, quarrying and dressing methods and tools for stone, structure of **timber**, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction, **Asphalt**, bitumen and tar used in construction, properties and uses, properties of lime, its types and uses, types of **soil** and its suitability in construction, properties of sand and uses, classification of coarse **aggregate** according to size.
Constituents of **brick** earth, conventional / traditional bricks, modular and standard bricks, Special bricks –fly ash bricks, characteristics of good brick, field tests on bricks, classification of burnt clay bricks and their suitability, manufacturing process of burnt clay brick, fly ash bricks, aerated concrete blocks.

Flooring tiles – Types, uses, manufacturing process of **cement**, dry and wet (only flow chart), types of cement and its uses, field tests on cement, precast **concrete blocks** - hollow, solid, pavement blocks and their uses.
Plywood, particle board, Veneers, laminated board and their uses, types of **glass**, soda lime glass, lead glass and borosilicate glass and their uses, **ferrous** and non-ferrous metals and their uses.

Unit – III Special and Processed Construction Materials
Types of material and suitability in construction works of materials- water proofing, termite proofing, thermal and sound insulating materials, Fibers, types, Jute, Glass, Plastic Asbestos Fibers, geo-polymer cement, geochemist- properties, uses.
Constituents and uses of Plaster of Paris (PoP), PoP finishing boards, sizes and uses, Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses, Industrial waste materials- flyash, blast furnace slag, Granite and marble polishing waste and their uses. Agro waste materials-Rice husk, Biogases, coir fibres and their uses, Special processed construction materials- Geo synthetic, Ferro Crete, Artificial timber, Artificial sand and their uses.

Unit – IV Construction of Structure
Job layout, site clearance, layout for load bearing structure and framed structure by center line and face line method, precautions, earthwork in excavation for foundation, timbering and strutting, earthwork for embankment, material for plinth filling, tools and plants used for earthwork.
Foundation: Functions of foundation, Types of foundation – Shallow Foundation, Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. Deep Foundation- Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only).
Stone masonry: Terms used in stone masonry- facing, backing, hearting, Through stone, corner stone, cornice, Types of stone masonry: Rubble masonry, Ashlars masonry and their types, Joints in stone masonry and their purpose, Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction.
Brick masonry: Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat bond, joints, lap, frog line, level and plumb, Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond, Requirements of good brick masonry, Junctions in brick masonry and their purpose and procedure, Precautions to be observed in Brick Masonry Construction, Comparison between stone and Brick Masonry, Tools and plants required for construction of stone and brick masonry, Hollow concrete block masonry and composite masonry.
Scaffolding and Shoring: Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Form work, Removal of formwork.

Unit–V: Building Finishes, Communication and Ventilation

Floors and Roofs: Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors, Roofing Materials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I sheets, Plastic and Fibre Sheets, Types of Roof: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs.

Wall Finishes: Plastering–Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings, Precautions to be taken in plastering, defects in plastering, Pointing– Necessity, Types of pointing and procedure of Pointing. Painting –Necessity, Surface Preparation for painting, Methods of Application.

Horizontal Communication: Doors– Components of Doors, Full Paneled Doors, Partly Paneled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors, Sizes of Door recommended by BIS.

Windows: Component of windows, Types of Windows - Full Paneled, Partly Paneled and Glazed, wooden, Steel, Aluminum windows, Sliding Windows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight, Sizes of Windows recommended by BIS, Ventilators, Fixtures and fastenings for doors and windows- Material used and functions of Window Sill, Lintels, Shed / Chajja.

Vertical Communication: Means of Vertical Communication- Stair Case, Ramps, Lift, Elevators and Escalators. Terms used in staircase- steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, Scotia, hand rails, newel post, landing, headroom, winder, Types of staircase (On the basis of shape), Straight, dog-legged, open well, Spiral, quarter turn, bifurcated, Three quarter turn and Half turn,(On the basis of Material), Stone, Brick, R.C.C., wooden and Metal.

References:

1. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
2. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
3. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
4. Duggal, S.K, Building Materials, New International, New Delhi.
5. Sushil Kumar., Building Construction, Standard Publication.
6. Punmia B.C., and Jain A.K. ,Building Construction, Firewall Media.
7. Sharma S.K., Building Construction, S. Chandand Co. Pvt. Ltd., New Delhi.

Course Outcomes:

After completing this course, student will be able to:

CO 1	Identify and use of relevant natural/ artificial/ special construction materials.

CO 2	Identify components of building structures.
CO 3	Propose suitable type of foundation for building structures.
CO 4	Select suitable type of masonry for building structures.
CO 5	Propose relevant finishes and means of communications for different types of buildings

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Course Code	:	CEPC 303
Course Title	:	Hydraulics
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

Course Content:

Unit–I Pressure measurement and Hydrostatic pressure

Technical terms used in Hydraulics –fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics, physical properties of fluid– density, specific volume, specific gravity, surface tension, capillarity, viscosity, Newton's law of viscosity, Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure, concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses, measurement of differential pressure by different methods, Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls, Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side

Unit–II Fluid Flow Parameters

Types of flow– Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow, Reynolds number, Discharge and its unit, continuity equation of flow, energy of flowing liquid, potential, kinetic and pressure energy, Bernoulli's theorem- statement, assumptions, equation.

Unit– III Flow through pipes

Major head loss in pipe- Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's diagram and nomograms, Minor losses in pipe- loss at entrance, exit, sudden contraction, sudden enlargement and fittings, Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe, Hydraulic gradient line and total energy line, water hammer

in pipes- causes and remedial measures, discharge measuring device for pipe flow, venturimeter, construction and working, discharge measurement using orifice, hydraulic coefficients of Orifice.

Unit– IV Flow through Open Channel

Geometrical properties of channel section, wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section, determination of discharge by Chezy's equation and Manning's equation, conditions for most economical rectangular and trapezoidal channel section, discharge measuring devices, triangular and rectangular Notches, velocity measurement devices, current meter, floats and pitot's tube, specific energy diagram, Froudes' number.

Unit– V Hydraulic Pumps

Concept of pump, types of pump- centrifugal, reciprocating, submersible, centrifugal pump, components and working, reciprocating pump, single acting and double acting, components and working, suction head, delivery head, static head, manometric head, power of centrifugal pump, selection and choice of pump.

References:

1. Bansal, R.K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi
2. Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
3. S.S.Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., NewDelhi
4. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
5. Khurmi RS, Hydraulics, Fluid Mechanics, Hydraulic machines, S.Chand Publishers
6. Rajput, RK, Fluid Mechanics, S. Chand, NewDelhi.
7. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford Uni- versity Press, New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Measure pressure and determine total hydrostatic pressure for different conditions.
- Understand various parameters associated with fluid flow.
- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.
- Select relevant hydraulic pumps for different applications.

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Course Code	:	CEPC304
Course Title	:	Mechanics of Materials
Number of Credits	:	3 (L:3,T:0,P:0)
Prerequisites	:	Engineering Mechanics (CEES 101)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
- To understand the concept of buckling loads for short and long columns.
- T understand the concept of combined direct and bending stresses
- To study torsion in a solid or hollow shaft

Course Content:

Unit–I Simple Stresses and Strains

Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity, type of Stresses-normal, direct, bending and Shear and nature of stresses i.e. Tensile and Compressive stresses, Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety, deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, composite section under axial loading, concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section) Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and triaxial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only), Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).

Unit–II Shear Force and Bending Moment

Types of supports, beams and loads, Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation), Shear force and bending moment diagram for cantilever, simply supported and overhang beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.

Unit–III Bending and Shear Stresses in beams

Bending Stress: Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram, concept of moment of resistance and simple numerical problems using flexural equation.

Shear Stress: Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram, shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.

Combined Direct and Bending Stress: Concentric and eccentric loads, eccentricity, simple cases of short columns of uniform section subjected to eccentric loading with stress diagram.

Unit– IV Columns and Struts

Concept of compression member, short and long column, Effective length, Radius of gyration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns. Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load, Rankine's formula and its application to calculate crippling load, concept of working load / safe load, design load and factor of safety.

Unit- V

Analysis of trusses: Concept of a frame, perfect, redundant and unstable frame, end supports, analysis of determinate truss by method of joints and method of sections.

Torsion: Concept of torsion, torsion equation (no derivation), shear stress diagram for solid and hollow shafts, comparison between solid and hollow shafts with regard to their strength and weight, Power transmission by shafts, concept of mean and maximum torque.

Strain energy: due to direct stresses, proof resilience and modulus of resilience, stress due to gradual, sudden and falling loads.

Thin walled tubes: Longitudinal and circumferential stresses in seamless thin walled tubes.

References:

1. Bedi D.S., Strength of Materials, Khanna Publishing House, Delhi, Ed.2018
2. Timoshenko, S., Strength of Materials, Vol.I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chandand Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia BC, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, Mc Graw Hill Education; New Delhi.
7. Bansal RK, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

Course Outcomes:

After completing this course, student will be able to:

- Analyse structural behavior of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beams and loading conditions.
- Determine the bending and shear stresses in beams under different loading conditions.
- Analyse the column for various loading and end conditions.
- Determine torsion in a solid or hollow shaft

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Course Code	:	CEPC 305
Course Title	:	Water Resources Engineering
Number of Credits		3 (L:3, T:0 ,P:0)
Prerequisites		NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

Course Content:

Unit-I Introduction to Hydrology

Hydrology- Definition and Hydrological cycle, Rain Gauge- Symon strain gauge, automatic rain gauge, methods of calculating average rainfall- Arithmetic mean, lsohyetal, and Theissen polygon method, Run off- Factors affecting Run off, computation of Run off, maximum flood discharge measurement- Rational and empirical methods, Simple numerical problems, yield and dependable yield of a catchment, determination of dependable yield.

Unit-II Crop water requirement and Reservoir Planning

Irrigation and its classification, Crop Water requirement- Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and capacity of canal, methods of application of irrigation water and its assessment, Surveys for irrigation project, data collection for irrigation project, area capacity curve, Silting of reservoir, Rate of silting, factors affecting silting and control measures, control levels in reservoir, simple numerical problems on fixing control levels.

Unit-Ill Dams and Spillways

Dams: Dams and its classification, Earthen dams and Gravity dams (masonry and concrete), Earthen Dams- components with function, typical cross section, seepage through embankment and foundation and its control, methods of construction of earthen dam, types of failure of earthen dam and preventive measures, Gravity Dams- Forces acting on dam, theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam,

Spillways: Definition, function, location, types and components, Energy dissipaters.

Unit-IV Minor and Micro Irrigation

Bandhara irrigation- Layout, components, construction and working, solid and open bandhara, Percolation Tanks- Need, selection of site, Lift irrigation scheme- components and their functions, layout, Drip and Sprinkler Irrigation- need, components and Layout, Well irrigation- types and yield of wells, advantages and disadvantages of well irrigation, Water logging and drainage: Definition, causes and effects, prevention and remedial measures, surface and sub surface drains and their layout.

Unit-V Diversion Head Works & Canals

Diversion Head Works: Weirs- components, parts, types, K.T. weir- components and construction, Diversion head works- Layout, components and their function, Barrages- components and their functions, difference between weir and Barrage.

Canals: classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth, Design of most economical canal section. Chezy's formula, Manning's formula, Kennedy's and Lacey's silt theories and equations, Canal lining - Purpose, material used and its properties, advantages, Cross Drainage works-Aqueduct, siphon aqueduct, super passage, level crossing, Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets.

References:

1. Punmia, B.C., Pande, Lal, Irrigation and Water Power Engineering, Laxmi Publications.
2. Subramanayan, Engineering Hydrology, Mc Graw Hill.
3. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S. Chand
4. Basak, N.N., Irrigation Engineering, Mc Graw Hill Education
5. Garg, SK, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Estimate hydrological parameters.
- Estimate crop water requirements of a command area and capacity of canals.
- Execute Minor and Micro Irrigation Schemes.
- Select the relevant Cross Drainage works for the specific site conditions.
- Design, construct and maintain simple irrigation regulatory structures.

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Course Code	:	CEPC 311
Course Title	:	Basic Surveying Lab
Number of Credits	:	1 (L:0,**T:**0,P:2)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand types of surveying works required
- To know the type of method and equipments to be used for different surveys
- To know the use and operational details of various surveying equipments.

List of Practical: (Minimum 10 practical to be performed)

1. Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
2. Undertake reciprocal ranging and measure the distance between two stations.
3. Determine area of open field using chain and cross staff survey.
4. Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.
5. Measure Fore Bearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.
6. Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building.
7. Plot the traverse on Al size imperial drawing sheet for data collected in Survey Project mentioned at practical No.6.
8. Undertake simple leveling using dumpy level / Auto level and leveling staff.
9. Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level / Auto Level and leveling staff.
10. Undertake fly leveling with double check using dumpy level / Auto level and leveling staff.
11. Undertake Survey Project with Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with cross-section at 30 m interval.
12. Plot the L-section with minimum 3 cross-sections on Al size imperial sheet for data collected in Survey Project mentioned at practical No.11.
13. Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10mx10m.
14. Plot the contours on Al size imperial drawing sheet for data collected in Survey Project mentioned at practical No. 13.
15. Measure area of irregular figures using Digital planimeter.

References:

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying-I, Laxmi Publications, New Delhi.
2. Arora K.R, Surveying Vol.-I, Standard Book House
3. Kanetkar,T.P.; Kulkarni, S.V., Surveying and Levelling volume-I, Pune Vidyarthi Gruh Prakashan.
4. Duggal, S.K., Survey - I, McGraw Hill Education, New Delhi.
5. Bhavikatti, S.S., Surveying and Levelling, Volume - 1, I.K. International, New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Select the type of survey required for given situation.
- Compute area of open field using chain, tape and cross staff.
- Prepare a profile of the ground for estimation of earthwork

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Course Code	:	CEPC 312
Course Title	:	Building Materials & Construction Lab
Number of Credits	:	1 (L:0, T:0, P: 2)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn about various construction materials, and understand the irrelevant characteristics.
- To be able to identify suitability of various materials for different construction purposes.
- To know about natural, artificial, and processed materials available for various purposes of construction activities.

List of practical: (Minimum 10 practical to be performed)

1. Identify various sizes of available coarse aggregates from sample of 10kg in laboratory and prepare report (60, 40, 20, 10 mm)
2. Identify the available construction materials in the laboratory on the basis of their sources.
3. Identify the grain distribution pattern in given sample of teak wood in the laboratory and draw the various patterns. (along and perpendicular to the grains)
4. Prepare the lime putty by mixing lime (1kg) with water in appropriate proportion and prepare report on slaking of lime.
5. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples. Part I
6. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples. Part II
7. Select first class, second class and third class bricks from the stake of bricks and prepare report on the basis of its properties.
8. Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests dropping, striking and scratching by nail and correlate the results obtained.
9. Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti-skid tiles, chequered tiles, paving blocks and prepare report about

the specifications.

10. Apply the relevant termite chemical on given damaged sample of timber.
11. Identify the type of glasses from the given samples.
12. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of lm x lm using suitable brush / rollers adopting safe practices. Part I
13. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of lm x lm using suitable brush / rollers adopting safe practices. Part II
14. Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a special processed construction material.
15. Prepare mortar using cement and Fly ash or Granite / marble polishing waste in the proportion 1:6 or 1:3.

References:

1. Ghose, D.N., Construction Materials, Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, New Delhi
3. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
4. Rajput, RK, Engineering Materials, S. Chand and Co., New Delhi.
5. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
6. Sharma C.P., Engineering Materials, PHI Learning, New Delhi.
7. Duggal, S.K, Building Materials, New International, New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Identify relevant construction materials.
- Select relevant special type of construction materials.
- Identify and use of processed construction materials.

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Course Code	:	CEPC 313
Course Title	:	Hydraulics Lab.
Number of Credits	:	1 (L:0,T:0,P:2)
Pre-requisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

List of Practical: (Minimum 10 experiments to be performed)

1	Use piezometer to measure pressure at a given point.
2	Use Bourdon's Gauge to measure pressure at a given point.
3	Use U tube differential manometer to measure pressure difference between two given points.
4	Find the resultant pressure and its position for given situation of liquid in a tank.
5	Use Reynold's apparatus to determine type of flow.
6	Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
7	Use Friction factor Apparatus to determine friction factor for a given pipe.
8	Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
9	Determine minor losses in pipe fitting due to Bend and Elbow.
10	Calibrate Venturimeter to find out the discharge in a pipe.
11	Calibrate the Orifice to find out the discharge through a tank
12	Use Current meter to measure the velocity of flow of water in open channel.
13	Use Pitot tube to measure the velocity of flow of water in open channel.
14	Use triangular notch to measure the discharge through open channel.

15	Use Rectangular notch to measure the discharge through open channel.
16	Determine the efficiency of centrifugal pump.

References:

1. Modi, P.N. and Seth, S .M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi, RS, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers, New Delhi.
5. Rajput, RK, Fluid Mechanics, S.Chand, New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Determine head loss of fluid flow through pipes.
- Find the fluid flow parameters in open channels.
- Select relevant hydraulic pumps for different applications.

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Course Code	:	CEPC 314
Course Title	:	Mechanics of Materials Lab.
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Engineering Mechanics (CEES 101)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To know the procedure for the conduct of tensile and compressive strength.
- To understand the concept of stress and strain through testing of different materials.
- To calculate shear force, bending moment and their corresponding stresses.

List of Practical: (Minimum 10 practical to be performed)

1. Study and understand the use and components of Universal Testing Machine (UTM).
2. Perform Tension test on mild steel as per IS:432 (1).
3. Perform tension test on Tor steel as per IS:1608,IS:1139.
4. Conduct compression test on sample test piece using Compression Testing Machine.
5. Conduct lzod Impact test on three metals. e.g. mild steel / brass / aluminum / copper / cast iron etc. as per IS:1598.
6. Conduct Charpy Impact test on three metals. e.g. mild steel / brass / aluminum / copper / cast iron etc. as per IS:1757.
7. Determine Water Absorption on bricks as per IS:3495 (part11), IS:1077 or tile IS: 1237.
8. Determine Compressive strength of dry and wet bricks as per IS:349S (part I), IS:1077.
9. Conduct Abrasion Test on flooring tiles (anyone) e.g. Mosaic tiles, Ceramic Tiles as per IS: 13630, Cement Tile as per IS: 1237.
10. Perform Single Shear and double shear test on any two metals e.g. Mild steel / brass / aluminum / copper / cast iron etc as per IS:5242.
11. Conduct Compression test on timber section along the grain and across the grain as per IS:2408.
12. Plot Shear force and Bending Moment diagrams for cantilever; simply supported beams.
13. Plot Shear force and Bending Moment diagrams for over hanging beams for different types of loads including moment loading.
14. Conduct Flexural test on timber beam on rectangular section in both orientation as

per JS:1708,JS:2408.

15. Conduct Flexure test on floor tiles IS: 1237, IS:13630 or roofing tiles as per IS:654, IS:2690.

References:

1. Khurmi, R.S., Strength of Materials, S Chandand Co. Ltd. New Delhi.
2. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
3. Punmia BC, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
4. Bansal RK, Strength of Materials, Laxmi Publications.
5. Subramaniam R, Strength of Materials, Oxford University Press.

Course Outcomes:

After completing this course, student will be able to:

- Test different Civil engineering materials on Universal Testing Machine.
- Interpret shear force and bending moment diagrams for various types of beam sections and different loading conditions.
- Determine bending and shear stresses in beams under different loading conditions.

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Course Code	:	CESI 316
Course Title	:	Summer Internship - I
Number of Credits	:	2 (L:0, T:0, P: 0)
Prerequisites	:	NIL
Course Category	:	SI

Summer Internship of at least 4 weeks duration is mandatory for each student. The students are supposed to have practical understanding and training in a suitable industry / field or an organization. After successful completion of training, the students shall be able to apply their skills in classroom learning for identification of problems. They are required to prepare a report in a specified format and power point presentation of the work. Summer Internship I should be undertaken in an industry / Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres / Institutes /Schemes.

Course Objectives:

- To provide industrial exposure to student that will help students to gain real life experience
- To engage students with experienced professionals that can help them further in their careers
- To provide industrial exposure to student to the real time
- To enable the students to work on short industry projects and gain the skill of preparing report, describing its results and findings
- To identify the gap between existing knowledge and industry expectations

Course Code	:	CEPC 401
Course Title	:	Advanced Surveying
Number of Credits	:	3 (L:0, T:0, P:0)
Prerequisites	:	Basic Surveying (CEPC 301)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To know different methods of plane surveying and theodolite surveying with their uses
- To learn tachometric surveying and curve setting
- To understand the principles of Electronic Distance Measurement equipment and Total Station and their use.
- To know the concept of remote sensing, GPS and GIS

Course Content:

Unit- I Plane Table Surveying

Principles of plane table survey, accessories of plane table and their use, Telescopic alidade, setting of plane table, orientation of plane table by Trough Compass, Back sighting, methods of plane table surveys, Radiation, Inter section and Traversing, Resection, merits and demerits of plane table survey.

Unit- II Theodolite Surveying

Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the Vernier of transit Theodolite, Technical terms, Swinging, Transiting, Face left, Face right, Fundamental axes of transit Theodolite and their relationship, temporary adjustment of transit Theodolite, Measurement of horizontal angle, Direct and Repetition method, Errors eliminated by method of repetition, Measurement of magnetic bearing of aline, Prolonging and ranging a line, deflection angle, Measurement of vertical Angle, Theodolite traversing by Included angle method and Deflection angle method, Checks for open and closed traverse, Calculations of bearing from angles, Traverse computation, Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.

Unit- Ill Tacheometric surveying and Curve setting

Principles of Tacheometry, Tacheometer and its component parts, Anallatic lens, Tacheometric formula for horizontal distance with telescope horizontal and staff vertical, field method for determining constants of tacheometer, Determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical, Limitations of tacheometry,

Types of curves used in roads and railway alignments, designation of curves, Setting simple circular curve by off sets from long chord and Rankine's method of deflection angles.

Unit- IV Advanced Surveying Equipments

Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM, Use of micro optic Theodolite and Electronic Digital Theodolite, Introduction to Total Station, Use of function keys, Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station.

Unit- V Remote Sensing, GPS and GIS

Remote Sensing: Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use/ Land cover, mapping, disaster management, Use of Global Positioning System (GPS.) instruments, Geographic Information System (GIS), Introduction, Components, Software for GIS, Introduction to Drone Surveying.

References:

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
2. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar,Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
3. Duggal, S.K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Basak, N.N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
5. Saikia, MD.; Das. B.M.; Das.M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
6. Subramanian, R., Surveying and Levelling, Oxford University Press, New Delhi.
7. Rao, P.Venugopala Akella, Vijayalakshmi, Text book of Surveying, PHI Learning Pvt. Ltd., New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Prepare plans using Plane Table Surveys.
- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Use EDM and Total Station instrument.
- Understand about GIS and GPS.

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Course Code	:	CEPC 402
Course Title	:	Concrete Technology
Number of Credits	:	2 (L:2, T:0, P:0)
Prerequisites	:	Building Materials and Construction (CEPC302)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

Course Content:

Unit- I Cement, Aggregates and Water

Physical properties of OPC and PPC- fineness, standard consistency, setting time, soundness, compressive strength, Different grades of OPC and relevant BIS codes**,** Testing of cement: Laboratory tests- fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement, BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement, Aggregates: Requirements of good aggregate, Classification according to size and shape, Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS383, Concept of crushed Sand, Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications, Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS:456.

Unit- II Concrete

Different grades of concrete, provisions of IS 456, Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposure conditions as per IS 456,

Properties of fresh concrete: Workability: Factors affecting workability of concrete, determination of workability of concrete by slump cone, compaction factor, Vee-Bee consistometer, Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures, Properties of Hardened concrete: Strength, Durability, Impermeability.

Unit- III Concrete Mix Design and Testing of Concrete

Concrete mix design: Objectives, methods of mix design, study of mix design as per IS 10262 (only procedural steps), Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results, Non-destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS13311 (part1 and 2), Importance of NDT tests

Unit- IV Quality Control of Concrete

Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete, Forms for concreting: Different types of formworks for beams, slabs, columns, materials used for formwork, requirement of good formwork, Stripping time for removal of formwork as per IS456, Water proofing: Importance and need of water proofing, methods of water proofing and materials used for water proofing, Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.

Unit- V Chemical Admixture, Special Concrete and Extreme Weather Concreting

Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers, Special Concrete, Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete self compacting concrete and light weight concrete, Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition, Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition.

References:

1. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
2. Gambhir, M.L., Concrete Technology, Tata McGrawHill Publishing Co. Ltd., Delhi.
3. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
4. Neville, A.M. and Brooks, **J.J.,** Concrete Technology, Pearson Education Pvt. Ltd.
5. Neville, A.M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.
6. Sood, H., Kulkarni P. D., Mittal L.N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Use different types of cement and aggregates in concrete
- Prepare concrete of desired compressive strength.
- Prepare concrete of required specification.
- Maintain quality of concrete under different conditions.
- Apply relevant admixtures for concreting.

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Course Code	:	CEPC 403
Course Title	:	Geotechnical Engineering
Number of Credits	:	2 (L:2, T:0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand physical and index properties of soil
- To understand classification of soil
- To estimate permeability and shear strength of soil
- To know the load bearing capacity of soil
- To learn various soil stabilization and compaction methods

Course Content:

Unit- I Overview of Geology and Geotechnical Engineering

Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, Definition of a rock: Classification based on their genesis (mode of origin), formation, classification and engineering uses of igneous, sedimentary and metamorphic rocks, Importance of soil as construction material in Civil engineering structures and as foundation bed for structures, field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam.

Unit- II Physical and Index Properties of Soil

Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight, determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, determination of specific gravity by pycnometer, Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit, Plasticity index, Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.

Unit-Ill Permeability and Shear Strength of Soil

Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability, Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems), Shear failure of soil, concept of shear strength of soil, Components of shearing resistance of soil, cohesion internal friction, Mohr-Coulomb failure theory, Effective stress, Strength envelope, strength equation for purely cohesive and cohesion less soils, direct shear and vane shear test laboratory methods.

Unit- IV Bearing Capacity of Soil

Bearing capacity and theory of earth pressure, concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure, Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity, Field methods for determination of bearing capacity, Plate load and Standard Penetration Test, test procedures as per IS:1888 & IS:2131, definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non-cohesive Soils.

Unit- V Compaction and stabilization of soil

Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line, factors affecting compaction, field methods of compaction-rolling, ramming and vibration, suitability of various compaction equipments, smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, difference between compaction and consolidation, concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization, Necessity of site investigation and soil exploration, types of exploration, criteria for deciding the location and number of test pits and bores, field identification of soil dry strength test, dilatancy test and toughness test.

References:

1. Murthy, V.N.S., Geotechnical Engineering, Principles and Practices of Soil Mechanics and Foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
2. Braja M. Das, Principles of Geotechnical Engineering, Cengage Learning, USA
3. Arora KR, Soil Mechanics and Foundation Engineering, Standard Publisher.
4. Ramamurthy, T.N. & Sitharam, T.G, Geotechnical Engineering (Soil Mechanics), S.

Chand and Company LTD., New Delhi.

5. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
6. Kasamalkar, B.**J.,** Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.

Course Outcomes:

After completing this course, student will be able to:

- Identify types of rocks and sub soil strata of earth.
- Interpret the physical properties of soil related to given construction activities.
- Use the results of permeability and shear strength test for foundation analysis.
- Interpret soil bearing capacity results.
- Compute optimum values for moisture content for maximum dry density of soil through various tests.

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Course Code	:	CEPC 404
Course Title	:	Theory of Structures
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	Mechanics of Materials (CEPC 304)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand the concept of slope and deflection in a beam problem
- To analyse beams using various methods like slope deflection, Clapeyron's three moment and moment distribution.
- To analyse simple portal frames without joint translation
- To analyse three hinged arches under static loading
- To understand the concept of Influence lines

Course Content:

Unit-I Slope and Deflection

Necessity for determination of slope and defection, Moment area theorems, deflection equation-relation among bending moment, slope, deflection and radius of curvature (no derivation), Computation of slopes and defections using moment area theorems and double integration method for cantilever and simple supported beam with u.d.l over entire span and concentrated load at any point.

Unit- II Statically indeterminate Beam

Introduction to statically indeterminate beams, degrees of freedom, degrees of restraints & degrees of indeterminacy in beams.

Propped Cantilevers: Definition of prop, prop reaction from deflection consideration. SF & BM diagrams by moment area theorem for udl and point loads, slope and deflection at a point by moment area theorem.

Fixed Beams: Introduction to fixed beam, determination of fixing moments by Moment Area theorem for point load and udl, SF and BM diagrams for supports, at the same level (sinking of supports at different levels not included), slope and deflection at a point by moment area theorem.

Continuous Beams: Introduction, Analysis of continuous beams, Clapeyron's theorem of three moments (no derivation), Application of Clapeyron's theorem of three moments for continuous beams of two spans with simply supported and fixed ends. SF and BM diagram for the above cases.

Unit- III Slope Deflection Method

Introduction, sign convention, fundamental equations (no derivation), Application of Slope Deflection method to continuous beams, simple portal frames without joints translation, BM diagrams for continuous beams and simple frames.

Unit-IV Moment distribution Method: Introduction, sign convention fundamental prepositions, stiffness factor, carry over factor, distribution factor. Application of moment distribution method to continuous beams up to three spans, simple portal frames with no side sway. BM diagrams for both beams and frames.

Unit- V Arches and Influence Lines

Three Hinged Arches: Introduction, linear arch, Eddy's theorem. Analysis of three hinged Arches, BM and normal thrust for parabolic, circular arch under static loading.

Influence Lines: Introduction, I.L. for shear force, B.M. and reaction. Application of I.L. diagrams for determination of SF and BM due to concentrated and uniformly distributed loads.

References:

1. Ramamrutham. S, Theory of structures, Dhanpatrai & Sons.
2. Khurmi, R.S., Theory of Structures, S. Chandand Co., New Delhi.
3. Bhavikatti, SS, Structural Analysis Vol-1,,Vikas Publishing House Pvt Ltd., New Delhi.
4. Junnarkar, S.B., Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5. Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Calculate Slope and deflection in statically indeterminate beam.
- Analyse Continuous beam and simple portal frame under different loading conditions using Slope Deflection method.
- Analyse Continuous beam and simple portal frame using Moment Distribution Method.
- Analyse three hinged arches under static loading.
- Analyse statically determinate beam under moving load.

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Course Code	:	CEPC 405
Course Title	:	Solid Waste Management
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	NIL
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To know various sources of solid.
- To learn techniques of collection and transportation of solid waste.
- To know various methods of disposal of solid waste.
- To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

Course Content:

Unit-I Introduction

Definition of solid waste, different solid waste – domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc., Sources of solid waste, classification of solid waste- hazardous and non-hazardous waste, physical and chemical characteristics of municipal solid waste.

Unit-II Storage, Collection and Transportation of Municipal Solid Waste

Collection, segregation, storage and transportation of solid waste, tools and Equipment- Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers, Community bin, like movable and stationary bin, transportation vehicles with their working capacity- animal carts, auto vehicles, tractors or trailers, trucks, dumpers, compactor vehicles, transfer station- meaning, necessity, location, Role of rag pickers and their utility for society.

Unit-Ill Composting of Solid Waste

Concept of composting of waste, Principles of composting process. Factors affecting the composting process, methods of composting- Manual Composting- Bangalore method, Indore method, Mechanical Composting- Dano Process, Vermi composting.

Unit-IV Techniques for Disposal of Solid Waste

Solid waste management techniques- solid waste management hierarchy, waste prevention and waste reduction techniques, Land filling technique, Factors to be considered for site selection, Land filling methods- Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill, Advantages and disadvantages of landfill method, Recycling of municipal solid waste, Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste -Definition, Methods

Unit-V Biomedical and E-Waste Management

Definition of Biomedical Waste, Sources and generation of Biomedical Waste and its classification, Biomedical waste Management technologies, Definition, varieties and ill effects of E-waste, Recycling and disposal of E-waste.

References:

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed. 2018
2. Bhide, A.D., Solid Waste Management, Indian National Scientific Documentation Centre, New Delhi.
3. George Techobanoglous, Kreith, Frank., Solid Waste, Mc Graw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

Course Outcomes:

After completing this course, student will be able to:

- Identify the sources of solid waste.
- Select the relevant method of collection and transportation of solid waste.
- Suggest an action plan for composting of solid waste.
- Devise suitable disposal technique for solid waste
- Use the relevant method for disposal of Biomedical and E-waste.

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Course Code	:	CEPC 411
Course Title	:	Advanced Surveying Lab
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Basic Surveying Lab (CEPC 311)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To know methods of plane surveying, Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting.
- To understand the principles of Electronic Distance Measurement and Total station and their uses.

List of Practical: (Minimum 10 experiments to be performed)

1	Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method.
2	Use plane table survey to prepare plans, locate details by Intersection Method.
3	Use plane table survey to prepare plans, locate details by Traversing Method.
4	Use plane table survey to carryout Survey Project for closed traverse for minimum five sides around a building.
5	Use transit theodolite to measure Horizontal and Vertical angle by Direct Method.
6	Plot the traverse on Al size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.
7	Use thedolite as a Tacheometer to compute reduced levels and horizontal distances.
8	Set out a circular curve by Rankine's Method of Deflection Angles.
9	Use micro optic Theodolite to Measure Horizontal angle by Direct Method.
10	Use EDM to measure horizontal distance.
11	Use Total station instrument to measure horizontal distances.
12	Use Total station instrument to measure vertical angle.
13	Use Total station instrument to carryout Survey Project for closed traverse for minimum five sides.
14	Plot the traverse on Al size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
15	Use GPS to locate the coordinates of a station.

References:

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
2. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar,Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
3. Duggal, S.K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Basak, N.N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
5. Saikia, MD.; Das. B.M.; Das.M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
6. Subramanian, R., Surveying and Levelling, Oxford University Press, New Delhi.
7. Rao, P.Venugopala Akella, Vijayalakshmi, Text book of Surveying, PHI Learning Pvt. Ltd., New Delhi..

Course Outcomes:

After completing this course, student will be able to:

- Prepare plans using Plane Table and Theodolite Surveys.
- Find distances and elevations using Tachometer.
- Make measurements using Total Station.

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Course Code	:	CEPC 412
Course Title	:	Concrete Technology Lab
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Building Materials and Construction Lab (CEPC312)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

List of Practical: (Minimum 10 experiments to be performed)

1	Determine fineness of cement by Blaine's air permeability apparatus or by sieving.
2	Determine specific gravity, standard consistency, initial and final setting times of cement.
3	Determine compressive strength of cement.
4	Determine silt content in sand.
5	Determine bulking of sand.
6	Determine bulk density of fine and coarse aggregates.
7	Determine water absorption of fine and coarse aggregates.
8	Determine Fineness modulus of fine aggregate by sieve analysis.
9	Determine impact value of aggregate
10	Determine crushing value of aggregate.
11	Determine abrasion value of aggregate.
12	Determine elongation and flakiness index of coarse aggregates
13	Determine workability of concrete by slump cone test.
14	Determine workability of concrete by compaction factor test.
15	To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.
16	Demonstration of NDT equipment.

References:

1. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
2. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
3. Santha kumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
4. Neville, A.M. and Brooks, **J.J.,** Concrete Technology, Pearson Education Pvt. Ltd.
5. Neville, A.M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.
6. Sood, H., Kulkarni P. D., Mittal L.N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Identify different types of cement by performing laboratory tests.
- Prepare concrete of required specification and maintain the quality of concrete applying scientific principles.
- Use relevant admixtures for improving the workability of concrete.

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Course Code	:	CEPC 413
Course Title	:	Geotechnical Engineering Lab.
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand and determine physical and index properties of soil.
- To estimate the permeability and shear strength of soil.
- To know the procedure for performing Standard Proctor Test

List of Practical: (Minimum 10 experiments to be performed)

1. Identification of rocks from the given specimen.
2. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part- 11).
3. Determine specific gravity of soil by pycnometer method as per IS2720 (Part-111).
4. Determine dry unit weight of soil in field by core cutter method as per IS2720 (Part-XXIX).
5. Determine dry unit weight of soil in field by sand replacement method as per IS2720 (Part- XXVIII).
6. Determine Liquid Limit and Plastic along with Plasticity Index of given soil sample as per IS 2720 (Part- V).
7. Determine Shrinkage limit of given soil sample as per IS2720 (Part-V).
8. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part- IV).
9. Use different types of soil to identify and classify soil by conducting field tests-Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.
10. Determine coefficient of permeability by constant head test as per IS 2720 (Part-XVII).
11. Determine coefficient of permeability by falling head test as per IS2720 (Part-XVII).
12. Determine shear strength of soil by direct shear test as per IS2720 (Part-XIII).
13. Determine shear strength of soil by vane shear test as per IS2720 (Part-XXX).
14. Determine MOD and OMC by standard proctor test of given soil sample as per IS 2720 (Part- Vll).

References:

1. Murthy, V.N.S., Geotechnical Engineering, Principles and Practices of Soil Mechanics and Foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
2. Braja M. Das, Principles of Geotechnical Engineering, Cengage Learning, USA
3. Arora KR, Soil Mechanics and Foundation Engineering, Standard Publisher.
4. Ramamurthy, T.N. & Sitharam, T.G, Geotechnical Engineering (Soil Mechanics), S. Chand and Company LTD., New Delhi.
5. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
6. Kasamalkar, B.**J.,** Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.

Course Outcomes:

After completing this course, student will be able to:

- Use the results of permeability and shear strength test for foundation analysis.
- Interpret the soil bearing capacity results.
- Compute optimum moisture content values for maximum dry density of soil through various tests.

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Course Code	:	CEPR 416
Course Title	:	Minor Project
Number of Credits	:	2 (L:0 T:0 P:4)
Prerequisites	:	NIL
Course Category	:	PR

Course Objectives:

- Understand the method of applying engineering knowledge to solve specific problems.
- Apply engineering and management principles while executing the project.
- Identify and solve complex engineering problems using professionally prescribed standards and demonstrate good verbal presentation and technical report writing skills.

Guidelines:

1. Project will have to be done by a group in their area of interest.
2. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The student will be assigned a faculty guide who would be the supervisor of the student.
5. The number of projects that a faculty can guide would be limited to two groups.
6. The project can be carried out in the campus or in an industry / field or an organization with prior approval from the principal through head of section.
7. Mandatory for every student to complete Survey camp of one week duration and submit the report to their concerned guide.
8. The project shall be completed and submitted at least one month before the last teaching day.

Course Outcomes:

After going through this course, the students will be able to:

CO 1	Conceptualize, design and implement solutions for specific problems.
CO 2	Communicate the solutions through presentations and technical reports
CO 3	Apply project and resource managements skills, professional ethics, societal concerns

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Course Code	:	CEPC 417
Course Title	:	Building Planning and Drawing Lab
Number of Credits	:	2 (L:0,T:0,P:4)
Pre-requisites	:	Engineering Graphics (MEES216)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn basic principles of building planning and drawing.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

List of Practical / Drawings to be Performed:

A. Sketch Book	
1	Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS962.
2	Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students)
3	a) Measure the units of existing building (Load Bearing / Frame structure).
	b) Draw line plan of measured existing building at serial no 3a to the suitable scale.
4	Draw line plan to suitable scale (Minimum l BHK, staircase, WC and Bathroom)
	a) Residential Bungalows (Minimum three plans)
	b) Apartment (Minimum two plans)
5	Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library).
6	Draw the following plans for a Framed Structure (One / Two BHK) from given line plan.
	a. Develope plan, Elevation
	b. Section for above developed plan.

	c. Site plan for above drawings including area statement, schedule of opening and construction notes.
B. Full Imperial Size Sheet (A l)	
1	Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2 BHK) with flat Roof and staircase showing a) Developed plan and elevation
	b) Section passing through Stair or W.C. and Bath
	c) Foundation plan and schedule of openings.
	d) Site plan (1:200), area statement, construction notes.
2	Draw submission drawing, to the scale of 1:100, of (G+1) Framed Structure Residential Building (2BHK) with Flat Roof and staircase showing: a) Developed plan.
	b) Elevation.
	c) Section passing through Staircase, WC and Bath
	d) Site plan (1:200) and area statement
	e) Schedule of openings and Construction Notes.
3	Draw the above mentioned drawing at serial number B-2 using CAD software and enclose the print out. a) Developed plan
	b) Elevation.
	c) Section passing through Staircase, W.C. and Bath
	d) Foundation plan.
	e) Site plan (1:200), area statement, Schedule of openings and construction notes.
4	Draw working drawing for above mentioned drawing at serial number B-2 showing: a) Foundation plan to the scale 1:50
	b). Detailed enlarged section of RCC column and footing with plinth filling.
	c) Detailed enlarged section of RCC Beam, Lintel and Chajjas.
	d) Detailed enlarged section of RCC staircase and slab.
5	Draw two point perspective drawing of small objects- steps, monuments, pedestals (anyone) scale 1:50
	a) Draw plan, elevation, eye level, picture plane and vanishing points
	b) Draw perspective view.

References:

1. Layal, J.S., Civil Engineering Drawing, Satya Prakashan, New Delhi

2. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mc Graw Hill Publishing
3. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd
4. Swamy, Kumara; Rao, N, Kameshwara, A., Building Planning and Drawing, Charotar Publication, Anand.
5. S. Bhavikatti, S.S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
6. Singh, Ajit, Working with Auto CAD 2000, Mc Graw Hill Publishing company Ltd.
7. Sikka, V.B., Civil Engineering drawing, S. K. Kataria and Sons, New Delhi

Course Outcomes:

After completing this course, student will be able to:

- Prepare manual line plans and working drawing of residential and public buildings using principles of planning.
- Prepare working drawing using CAD for the given requirement of Framed Structure.
- Draw two point perspective drawing for given small objects.

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Course Code	:	CEAU 400
Course Title	:	Essence of Indian Knowledge and Tradition
Number of Credits	:	0 (L:2, T:0; P:0)
Prerequisites	:	NIL
Course Category	:	AU

Course Content:

- Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उऩवेद (आयुवेद, धनुवेद, गन्धवेद ,स्थाऩत्यआदद) (iii) वेदथाथांग (शिक्था, कलऩ, ननरुत , व्थाकरण , ज्योनतषछथांद), (iv) उऩथाइग (धर्मशथास्र , र्ीर्थाथांसथा, नुरथाण, तकशरथास्र)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

References:

1. Sivarama Krishna, Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai,
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritz of Capra, The wave of Life
4. Fritz of Capra, Tao of Physics
5. V N Jha, Arkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad,
6. Amakuam, RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi

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Course Code	:	CEPE 501
Course Title	:	Design of Steel Structures
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	Theory of Structures (CEPC 404)
Course Category	:	PE

Course Objectives:

- To understand the concept of Limit State Design
- To learn the concept involved in the design of bolted and welded connections
- To learn the concept of Limit State design of tension and compression of steel members
- To learn the concept of Limit State design of steel beams
- To learn the concept of design of steel roof truss and purlins

Course Content:

Unit-I Introduction to Steel Structures

Introduction: Introduction of steel structures, different types of steel and steel structures, stress strain diagram and ductility of mild steel. Properties of structural steel as per IS code- physical and mechanical properties, various types of rolled steel sections, advantages and disadvantages of steel structures. Different types of loads and load combinations. Design philosophy; limit state method of design as per IS Code: 800-2007

Structural steel connections: Riveted, Bolted and welded connections. Design of bolted and welded connections for axially loaded members.

Unit-II Design of Tension Members

Design of Tension members as per IS code: 800-2007, Design strength of tension member due to yielding of gross section, Rupture strength of critical section and block shear. Design of tension member, flats and angles (Single or double sections)

Unit-III Design of Compression Members

Design of compression members as per IS code: 800-2007, Concept of buckling, slenderness ratio, shape of compression members, buckling class, design compressive stresses and strengths. Design of strut and axially loaded column, Sketch of built up section with lacing or battens (no design), Design of slab base and gusseted base, sketch of column splices.

Unit-IV Design of Structural Steel Beams

Beams: Design of beam as per IS code: 800-2007, plastic moment carrying capacity of a section, Bending and shear strength of laterally supported beam. Deflection limits, web bucking and web crippling. Design of simple supported steel beam (laterally restrained beam only).

Plate Girders: Sketch of plate girder and its elements, Structural behaviour, deflected shapes and functions of various elements of a plate girder, sketches of different types of beam to beam and beam to column connections.

Unit-V Steel Roof Truss

Steel Roof Truss: Types of roof trusses, Calculation of dead, live and wind loads, design of purlin, design of members of a roof truss, design of joints, Erection of industrial steel sheds (preparation and inspection of column bases, erections of column, longitudinal bracing, field connections, erection of trusses).

References:

1. Duggal, S.K, Limit State Design of Steel Structures, Tata McGraw Hill Publication
2. Subramanian N., Steel structures Design and Practice, Oxford University Press Publication
3. Sia Ram, K.S, Design of Steel Structures by Limit State Method, Pearson Publication
4. Shiyekar, M.R, Limit State Design of Steel Structures, PHI Publication
5. IS Code 800 - 2007, Code of Practice for use of Structural steel in General Building Construction
6. Steel Table by R. Agor, Birla Publication Pvt. Ltd.

Course Outcomes:

After completing the course, students will be able to perform:

- Design of bolted and welded connections
- Design of steel tension members
- Design of steel compression members
- Design of steel I section beams
- Design of steel roof truss & purlins

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Course Code	:	CEPE 502
Course Title	:	Design of R.C.C Structures
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	Theory of Structures (CEPC 404)
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To learn the concept of Working Stress method for the design of a singly reinforce rectangular beam section
- To learn complete design of a rectangular and flanged beam by using limit state method and as per IS456
- To be able to do the design of stirrups
- To know the serviceability requirement and detailing of reinforcement.
- To understand the curtailment of reinforcement in a beam.

Course Content:

Unit-I Introduction to Working Stress Method

Introduction, different grades of concrete and steel, I.S specifications, purpose of providing reinforcement, modular ratio, types of loads on structures as per IS:875. Design philosophies-- working stress method, ultimate strength method and limit state method.

Singly Reinforced Rectangular Beams by WSM: Assumptions made in working stress method, permissible stresses, stress and strain distribution for rectangular section, Modes of failure of beam in flexure- actual and critical neutral axis, Under / Over reinforced and Balanced section, Lever arm, Moment of resistance. Analysis and design of singly reinforced rectangular beam section by using working stress method (Simple problems).

Unit-II Singly Reinforced Beams by Using Limit State Method

Introduction to Limit State method: Different Limit States, characteristic and design strength of materials, characteristic loads, partial safety factor for loads and materials, Assumptions for limit states of collapse in flexure, stress strain relation for concrete and steel, maximum strain in concrete. Modes of failure; Under / Over and Balanced section, mathematical derivation for moment of resistance, maximum and minimum reinforcement, effective span, Analysis and design of singly reinforced rectangular beam section by using limit state method and IS456-2000, numerical problems.

Unit-III Doubly Reinforced Beams by Using Limit State Method

Introduction, stress in compression reinforcement, design steps, minimum and maximum reinforcement. Analysis and design of doubly reinforced rectangular beam section by using limit state method.

Unit-IV Flanged Beams and Serviceability Limit States

Flanged Beam: Introduction, effective width of flange, minimum and maximum reinforcement, types of problem- neutral axis lies in flange or web, analysis and design of flanged beam section by limit state method.

Serviceability Limit States: Serviceability limit state for deflection and cracking (no numerical problems), serviceability requirements.

Curtailment: Requirements for curtailments and detailing of reinforcement.

Unit-V Design of Shear & Development Length

Introduction, Limit state of collapse in shear, nominal shear stress, design shear strength of concrete, design strength of vertical/ inclined stirrups and bent up bars in shear, principle of shear design, critical section for shear, nominal shear stress, design of stirrups for simply supported, cantilever rectangular and flanged beam. Anchorage and spacing of shear reinforcement, development length in tension and compression members, anchorage bond, types of bond, bond stress, check for bond stress, anchorage value of 90 degree hook, lapping of bars, check as per IS 456.

Design of beams: Complete design of a cantilever, simply supported and continuous beams, detailing of reinforcement as per SP: 34.

References:

1. Jain A.K, Reinforced Concrete Limit State Design, Nem Chand & Bros, Roorkee
2. Shah, V.L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
3. Sinha N.C., and Roy S.K, Fundamentals of Reinforced Concrete, S.Chand & Co., New Delhi.
4. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
5. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
6. Varghese, P.C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pvt. Limited, Delhi.
7. Plain and Reinforced Concrete- Code of Practice, IS: 456- 2000, Manak Bhawan, New Delhi.

Course Outcomes:

After completing this course, student will be able to:

- Design Singly reinforced rectangular beam by using Working Stress method
- Design of singly, doubly and flanged reinforced RCC beam by using Limit State method
- Design of RCC beam for shear reinforcement (stirrups) and development length.
- Apply the serviceability requirements and curtailment of reinforcement in R.C design
- Do the complete design of a beam, detailing and curtailment of reinforcement

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Course Code	:	CEPC 503
Course Title	:	Transportation Engineering
Number of Credits	:	3 (L: 3, T:0, P:0)
Prerequisites	:	Geotechnical Engineering (CEPC 403)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks
- To identify the component of Bridges

Course Content:

Unit- I Overview of Transportation Engineering

Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics, different modes of transportation- land way, waterway, airway, merits and demerits of road way and railway, general classification of roads, selection and factors affecting road alignment, hill road, drainage of hill road.

Introduction to Bridges, components of a bridge, factors governing the ideal site selection, bridge foundations, classification of foundations shallow foundations, deep foundation, pile foundation, Well foundations, types of piers, abutments and wing walls, types of super structure steel girders, types of girders, plate girder, box girder, bridge bearings, types of bridge bearing, different types of bridges, maintenance of bridges.

Unit- II Geometric Design of Highway

Camber- definition, purpose, types as per IRC recommendations, Kerbs, Road margin, road formation, right of way, design speed and various factors affecting design speed as per IRC recommendations, gradient- definition, types as per IRC recommendations, Sight distance(SSD)- definition, types IRC recommendations, simple numerical, Curves-necessity, types, horizontal, vertical curves, extra widening of roads- numerical examples, Super elevation- definition, formula for calculating minimum and maximum Super elevation and method of providing super elevation, Standard cross-sections of national highway in embankment and cutting, Traffic Engineering, traffic study, origin and destination study, variation of traffic, traffic signs, traffic marketing, traffic islands and signals.

Unit- Ill Construction of Road Pavements

Types of road materials and their Tests, California Bearing Ratio (CBR) test, Test on aggregates- Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test, Pavement- definition, types, Structural Components of pavement and their functions**, c**onstruction of WBM road, merits and demerits of WBM & WMM road, Construction of Flexible pavement/ Bituminous Road, Types of Bitumen and its properties, Emulsion, Cutback, Tar, terms used in BR-prime coat, tack coat, seal coat, merits and demerits of BR, Cement concrete road- methods of construction, Alternate and Continuous Bay method, Construction joints, filler and sealers, merits and demerits of concrete roads, types of joints.

Unit- IV Basics of Railway Engineering

Classification of Indian Railways, zones of Indian Railways**,** Permanent way, Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge, Rail, Rail Joints- requirements, types, Creep of rail- causes and prevention, Sleepers, functions and requirement, types of concrete sleepers and their density**,** Ballast, function and types, suitability, Rail fixtures and fastening, fish plate, spikes, bolts, keys, bearing plates, chairs, types of anchors and anti-creepers.

Unit- V Track geometrics, Construction and Maintenance

Alignment- factors governing rail alignment, Track Cross sections- standard cross section of single and double line in cutting and embankment, Important terms- permanent land, formation width, side drains, Railway Track Geometrics- Gradient, curves, types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail, branching of Tracks, Points and crossings, Turn out types, components, functions and inspection, Track junctions- crossovers, scissor crossover, diamond crossing, track triangle, Station- Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station, Station yard- classification, Passenger, goods, locomotive and marshalling yards, function & drawbacks of marshalling yards, Track Maintenance- necessity, Classification, Tools required for track maintenance with their functions, organisation of track maintenance, duties of permanent way inspector, gang mate and key man.

References:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93- 82609-858) Edition 2018
2. Khanna S.K, Justo, C E Gand Veeraragavan, A., Highway Engineering, Nern Chand and Brothers, Roorkee.
3. Arora, N.L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena SC and Arora SP, A Text book of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg, Standard Book House, New Delhi.
6. Duggal, Ajay K. and Puri, V.P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
7. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

Course Outcomes:

After completing this course, student will be able to:

- Identify the types of roads as per IRC recommendations.
- Implement the geometrical design features of different highways.
- Perform different tests on road materials.
- Identify the components and defects in railway tracks.
- Understand the components of a highway Bridge

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Course Code	:	CEPC 504
Course Title	:	Estimating, Costing and Valuation
Number of Credits	:	2 (L:2, T:0, P:0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To understand the different types of contract for Civil Engineering projects.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.
- To get acquainted with rent fixation and valuation of civil structures.

Course Content

Unit- I Fundamentals of Estimating and Costing

Estimating and Costing, meaning, purpose, Administrative approval, Technical Sanction and Budget provision, Types of estimates, approximate and detailed estimate, types and uses of Estimates, Revised estimate, Supplementary estimate, repair and maintenance estimate, renovation estimate, roles and responsibility of estimator, check list of items in load bearing and framed structure, standard formats of measurement sheet, Abstract sheet, Face sheet, modes of measurement and desired accuracy in measurements for different items of work as per IS:1200, rules for deduction in different category of work as per IS:1200, description / specification of items of building work as per CPWD / DSR.

Unit- II Approximate Estimates and Contract

Approximate estimate: Definition, Purpose, Methods of approximate estimate, Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numerical), Approximate estimate for roads, Railways, bridges / culvert, irrigation projects and water supply projects.

Contract: Definition of contract, objects of contract, requirements of contract, overview of Indian Contract Act, Types of engineering contract, Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract.

Unit- III Detailed Estimate

Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting, Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numerical), Long wall and Short wall method, Centre line method, Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements, Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc, Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.

Unit- IV Estimate for Civil Engineering Works

Earthwork– Quantities for roads, Embankment and canal by mid sectional area method, mean sectional area method, prismoidal and trapezoidal formula method, Detailed estimate for septic tank, Community well, Use of computer / softwares / programmes for detailed estimate Preparation of Civil Engineering Works.

Unit- V Rate Analysis and Valuation

Rate Analysis: Definition, purpose and importance, Lead (Standard and Extra), lift, overhead charges, water charges and contractor's profit, procedure for rate analysis, Task work- definition, types, Task work of different skilled labour for different items, categories of labours, their daily wages, types and number of labours for different items of work, Transportation charges of materials- Lead and Lift, Hire charges of machineries and equipments, Preparing rate analysis of different items of work pertaining to buildings and roads.

Valuation: Definition and purpose of Valuation, role of valuer, definition, Cost, Price and Value, characteristics of Value, factors Affecting Value, Types of Value, Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value, Depreciation, Obsolescence, Sinking Fund, methods of calculation of Depreciation- Straight Line Method, Sinking Fund Method, Constant Percentage Method, Fixation of rent, Lease- types of lease, lease hold property and freehold property, Mortgage, Mortgage deed, precautions to be taken while making mortgage.

References:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Rangwala, S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
3. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company (P) Ltd. New Delhi.
4. Patil,B.S.,Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
5. Chakraborti, M., Estimating and costing, specification and valuation in civil

engineering, Monojit Chakraborti, Kolkata.
6. CPWD Schedule of Rates.
7. Ministry of Road Transport and Highways (MORT & H) Specifications and Analysis of Schedule of Rates.

Course Outcomes:

After completing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate and contract of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate using rate analysis techniques, rent fixation and valuation of given civil structures

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Course Code	:	ME/CEOE 505
Course Title	:	Construction Management
Number of Credits	:	3 (L:3 ,T:0 ,P:0)
Prerequisites	:	Building Materials & Construction (CEPC 302)
Course Category	:	OE

Course Objectives:

Following are the objectives of this course:

- To understand the contract management and associated labour laws.
- To prepare and understand the principles involved in site layout.
- To know the procedure for scheduling of various activates in construction project.
- To understand the labour laws, procedure for arbitration, settlements.
- To know different safety measures in construction projects.

Course Content:

Unit- I Construction Industry and Management

Organization-objectives, principles of organization, types of organization: government / public and private construction industry, Role of various personnel in construction organization**, a**gencies associated with construction work- owner, promoter, builder, designer, architects, role of consultant for various activities, preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.

Unit- II Site Layout

Principles governing site layout, factors affecting site layout, preparation of site layout, land acquisition procedures and providing compensation.

Unit- III Planning and Scheduling

Identifying broad activities in construction work & allotting time to it, methods of Scheduling, Development of bar charts, merits & limitations of bar chart, elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events, CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and

total floats, critical activities and critical path, purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration, Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity, Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g.www.inampro.nic.in)

Unit- IV Construction Contract sand Specifications

Types of Construction contracts, Contract documents, specifications, general special conditions, Contract Management, procedures involved in arbitration and settlement (Introduction only)

Unit- V Safety in Construction

Safety in Construction Industry- Causes of Accidents, Remedial and Preventive Measures, Labour Laws and Acts pertaining to civil construction activities (Introduction only)

References:

1. Sharma, SC and Deodhar SV, Construction Engineering and Management, Khanna Book Publishing, New Delhi.
2. Gahlot, P.S. and Dhir, B.M, Construction planning and management, New Age International (P) Ltd. Publishers, NewDelh
3. Khanna, O.P., Industrial Engineering and management, Dhanpat Rai, New Delhi
4. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P) Ltd.
5. Sengupta, B.,Guha H., Construction Management and Planning, Tata McGraw Hill.
6. Harpal, Singh, Construction Management and accounts, Mc Graw Hill.
7. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

Course Outcomes:

After completing this course, student will be able to:

- Understand the contract management and associated labour laws.
- Prepare and understand the problems executing the site layout.
- Prepare networks and bar charts for the given construction project.
- Understand the intricacies of disputes, related arbitration and settlement laws.
- Apply safety measures at construction projects.

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Course Code	:	CEPC 513
Course Title	:	Transportation Engineering Lab
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Geotechnical Engineering Lab (CEPC 413)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand the geometrical design features of different highways.
- To perform different tests on road materials and CBR
- To identify the components of railway tracks.

Course Content:

List of practicals: (Minimum 10 experiments to be performed)

1	Draw the sketches showing standard cross sections of Express ways, Free ways, NH / SH, MDR / ODR
2	Flakiness and Elongation Index of aggregates.
3	Angularity Number of aggregates.
4	Aggregate impact test
5	Los Angeles Abrasion test
6	Aggregate crushing test
7	Softening point test of bitumen.
8	Penetration test of bitumen.
9	Flash and Fire Point test of bitumen.
10	Ductility test of Bitumen.
11	Determination of CBR value on the field as per IS2720 (Part-XVI).
12	Visit the constructed road for visual inspection to identify defects and suggest remedial measures.
13	Visit the hill road constructed site to understand its components.
14	Visit the road of any one type (flexible or rigid) to know the drainage condition.
15	Visit to railway track for visual inspection of fixtures, fasteners and yards.

References:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi
2. Khanna S.K, Justo, C E Gand Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N.L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena, S.C and Arora S.P, A Text book of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg, Standard Book House, New Delhi.
6. Duggal, Ajay K. and Puri, V.P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
7. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

Course Outcomes:

After completing this course, student will be able to:

- Implement the geometrical design features of different highways.
- Perform different tests on road materials and CBR
- Identify the components and defects of railway tracks.

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Course Code	:	CEPC 514
Course Title	:	Estimating, Costing and Valuation Lab.
Number of Credits		1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

List of Practical: (Minimum 10 practical to be performed)

1	Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2	Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3	Study of items with specification given in the DSR (for Civil Items)
4	Recording in Measurement Book (MB) for any four Civil items
5	Prepare bill of quantities of given item from actual measurements (for Civil Items).
6	Prepare approximate estimate for the given civil engineering works.
7	Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR (1 BHK Building with staircase).
8	Prepare detailed estimate from the given set of drawings using "standard measurement and abstract format" for RCC framed structure using description of item from DSR.
9	Calculate the reinforcement quantities from the given set of drawings for a room size of 3m X 4m with bar bending schedule (footing, column, beam, lintel with chajja, slab).
10	Prepare rate analysis for the given five item of works.
11	Prepare detailed estimate of road of one kilometer length from the given drawing.
12	Prepare detailed estimate of small Septic tank from the given set of drawings.
13	Prepare detailed estimate of well from the given set of drawing.
14	Use the relevant software to prepare detailed estimate of a Road.
15	Use the relevant software to prepare detailed estimate of a residential building.

References:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Rangwala, S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
3. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company (P) Ltd. New Delhi.
4. Patil,B.S.,Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
5. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
6. CPWD Schedule of Rates.
7. Ministry of Road Transport and Highways (MORT & H) Specifications and Analysis of Schedule of Rates.

Course Outcomes:

After completing this course, student will be able to:

- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.

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Course Code	:	CESI 516
Course Title	:	Summer Internship - II
Number of Credits	:	2 (L:0, T:0, P: 0)
Prerequisites	:	NIL
Course Category	:	SI

Summer Internship of at least 4 weeks duration is mandatory for each student. The students are supposed to have practical understanding and training in a suitable industry / field or an organization. After successful completion of training, the students shall be able to apply their skills in classroom learning for identification of problems. They are required to prepare a report in a specified format and power point presentation of the work. Summer Internship II should be undertaken in an industry / Govt. or Pvt. Certified Agencies which are in social sector/ Govt. Skill Centres / Institutes /Schemes.

Course Objectives:

- To provide industrial exposure to student that will help students to gain real life experience
- To engage students with experienced professionals that can help them further in their careers
- To provide industrial exposure to student to the real time
- To enable the students to work on short industry projects and gain the skill of preparing report, describing its results and findings
- To identify the gap between existing knowledge and industry expectations

Course Code	:	CEPR 517
Course Title	:	Major Project - I
Number of Credits	:	1 (L:0 T:0 P:2)
Prerequisites	:	NIL
Course Category	:	PR

Course Objectives:

- Understand the method of applying engineering knowledge to solve specific problems.
- Apply engineering and management principles while executing the project.
- Identify and solve complex engineering problems using professionally prescribed standards and demonstrate good verbal presentation and technical report writing skills.

Guidelines:

1. Project will have to be done by a group in their area of interest.
2. Each group has to select a contemporary topic that will use the technical knowledge of their program of specialization.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The student will be assigned a faculty guide who would be the supervisor of the student.
5. In Major Project - I it is mandatory to complete at least:
   - Project topic
   - Problem statement, Introduction and Literature review
   - Methodology of work
   - Knowledge of software, if applicable

Course Outcomes:

After going through this course, the students will be able to:

CO 1	Conceptualize, design and implement solutions for specific problems.
CO 2	Communicate the solutions through presentations and technical reports
CO 3	Apply project and resource managements skills, professional ethics, societal concerns

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Course Code	:	CEPC 518
Course Title	:	Structural Engineering Drawing Lab
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	Building, Planning and Drawing Lab (CEPC 417)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn the detail sketches of various structural steel members connections and column bases
- To understand the concept of sketches of various R.C structural components along with reinforcement details
- To learn the sketches of R.C. cantilever retaining wall with reinforcement details

List of Practical: (Minimum 10 practical to be performed)

1	Draw any five commonly used rolled steel sections and five built up sections.
2	Draw sketches of bolted and welded connections of Tension member (Single or double angle section with gusset plates)
3	Draw sketches of beam to beam connection (seated and framed)
4	Draw sketches of beam to column connection (seated and framed)
5	Draw sketches of column to column connection (details of column splices)
6	Draw sketches for single and double lacing of a given built up column
7	Draw sketches for battening of given built up columns.
8	Draw sketches of column base connections (slab base and gusset base)
9	Draw detail sketches of joints of a steel roof truss (ridge and eves)
10	Draw cross section, strain diagram & stress diagram for singly reinforced section.
11	Draw cross section, strain diagram & stress diagram for doubly reinforced section.
12	Draw sketches of different R.C. beams, showing reinforcement details
13	Draw sketches of different R.C. columns showing reinforcement details
14	Draw sketches of different R.C. slabs showing reinforcement details
15	Draw sketches of different R.C. dog legged staircase showing reinforcement details

16	Draw sketches of different R.C. column footing showing reinforcement details
17	Draw sketches of R.C. cantilever retaining wall showing reinforcement details

References:

1. Layal J.S., Civil Engineering Drawing, Satya Prakashan, New Delhi
2. Shah, V.L., and Gore,V., Limit State Design of Steel Structures, Structures Publications, Pune.
3. SP 34: Handbook on Concrete Reinforcement and Detailing
4. IS Code 800 - 2007, Code of Practice for use of Structural steel in General Building Construction
5. Plain and Reinforced Concrete- Code of Practice, IS: 456- 2000, Manak Bhawan, New Delhi.
6. Sikka, V.B., Civil Engineering drawing, S. K. Kataria and Sons, New Delhi

Course Outcomes:

After completing this course, student will be able to:

- Prepare sketches of Structural steel members connections
- Draw Structural steel column bases and Structural steel roof truss ridge and eves connection
- Different R.C. structural members showing reinforcement details

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Course Code	:	CEPC601
Course Title	:	Public Health Engineering
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	Solid Waste Management (CEPE 405)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn the principles for identification of sources of surface and sub surface water
- To learn calculation of population and requirement of drinking water
- To understand the plotting of water supply scheme highlighting different features
- To know evaluation of characteristics and treatment of sewage.

Course Content:

Unit- I Sources, Demand and Quality of water

Water supply schemes- Objectives, components, Sources of water: Surface and Sub surface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes, Demand of water: Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town, Quality of water: Need for analysis of water, Characteristics of water-Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, Ecoli, B coli index, MPN, Sampling of water, Water quality standards as per IS10500.

Unit- II Purification of water

Purification of Water: Objectives of water treatment, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator, Filtration- mechanisation of filtration, classification of filters: slow sand filter, rapid sand filter, pressure fitter. Construction and working of slows and filter and rapid sand filter, operational problems infiltration, Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants, Miscellaneous water Treatments: Introduction to water softening, Defluoridation techniques.

Unit- III Conveyance and Distribution of water

Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline, Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water- Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.

Unit- IV Domestic sewage and System of Sewerages

Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions-Sewage, sullage, types of sewage, Definition of the terms related to Building Sanitation-Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe, Building Sanitary fittings-Water closet-Indian and European type, flushing cistern, wash basin, sinks, Urinals, Traps- types, qualities of good trap, Systems of plumbing- one pipe, two pipe, single stack, choice of system, Principles regarding design of building drainage, inspection and junction chambers, their necessity, location, size and shape, Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.

Unit- V Characteristics and treatment of Sewage

Analysis of sewage: Characteristics of sewage, B.O.D., C.O.D and its significance, Central Pollution Control Board Norms for discharge of treated sewage, Objects of sewage treatment and flow diagram of conventional sewage treatment plant, Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch, Septic tank, Recycling and Reuse of domestic waste.

References:

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol.I and Vol.II, Khanna Publishers
3. Birdie, G.S. and Birdie, J.S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, BC, Environmental Engineering, vol.I and II, Laxmi Publishers
7. Peavy HS, Rowe DR, and Tchobanoglous G., Environmental lEngineering, McGraw Hill Publication

Course Outcomes:

After completing this course, student will be able to:

- Know the procedure to identify the sources of surface and subsurface water
- Estimate the quantity of drinking water required for a population
- Draw labeled layout for water supply scheme.
- Device suitable water treatment technique.
- Evaluate the characteristics and suggest treatment of sewage.

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Course Code	:	CEPE 602
Course Title	:	Advance Design of R.C.C Structures
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	Design of R.C.C Structures (CEPC 502)
Course Category	:	PE

Course Objectives:

Following are the objectives of this course:

- To understand the concept for design of one / two way slabs and dog legged staircase
- To identify short and long columns and their design provisions
- To design the isolated and combined R.C footing.
- To design R.C water tank and cantilever retaining wall
- To understand the analysis of multistorey building under lateral loads

Course Content:

Unit-I Design of Slab

Design of One Way Slabs: Classification of slabs, effective span, thickness of slab by deflection criteria, main/secondary reinforcement, minimum reinforcement. Complete design of cantilever, simply supported slabs and sun shades by limit state method, detailing of reinforcement as per SP:34, curtailment of bars.

Design of Two Way Slabs: Introduction, middle and edge strips, B.M coefficients, simply supported and restrained slabs, provision for torsion reinforcement. Complete design of two way slabs by using B.M. coefficients with different boundary condition, detailing of reinforcement as per SP:34, curtailment of bars.

Unit-II Design of Staircase and Column

Design of staircases: Introduction to staircases, types of stairs according to geometry and structural behavior, effective span of stairs, effective breadth of flights. Design of dog-legged staircase, detailing of reinforcement as per SP:34.

Design of Columns: Limit states of collapse in compression, assumptions, effective length of compression members, slenderness limits for columns, classification of columns, minimum eccentricity for column loads, longitudinal and transverse reinforcement. Design of axially loaded short columns with lateral ties/ helical reinforcement, detailing of reinforcement as per SP:34

Unit-III Design of Column Footing

Introduction, Bearing capacity of soil, depth of foundation, types of footings, isolated and combined footings, minimum thickness, critical sections, minimum reinforcement, development length, anchorage, cover, minimum edge thickness. Design of isolated footing

(square and rectangular) with uniform/ varying thickness, design of combined footing, detailing of reinforcement as per SP:34.

Unit-IV Design of Water Tank and Retaining Wall

Water Tanks: Introduction, members subjected to axial tension, bending moment, combined direct and bending moment, permissible stresses in concrete, steel, minimum reinforcement, design of circular and rectangular tanks resting on ground, elevated or overhead water tanks.

Retaining walls: Introduction, types of retaining walls, forces on retaining walls, stability requirements, proportioning and design of cantilever retaining wall.

Unit-V Multistorey Buildings

Introduction, Structural systems, Loads- dead load, live load, wind load and earthquake load, reduction in live load, load combinations, Analysis for lateral loads, Design of a simple multistorey framed building for load combinations by using manual calculation and with the help of structural software like STAAD PRO.

References:

1. Jain A.K, Reinforced Concrete Limit State Design, Nem Chand & Bros, Roorkee
2. Shah, V.L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
3. Sinha N.C., and Roy S.K, Fundamentals of Reinforced Concrete, S.Chand & Co., New Delhi.
4. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
5. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
6. Varghese, P.C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pvt. Limited, Delhi.
7. Plain and Reinforced Concrete- Code of Practice, IS: 456- 2000, Manak Bhawan, New Delhi.

Course Outcomes:

After completing this course, student will be able to design/ analyse

- One/two way slab and dog legged staircase
- Axially loaded column and their footing
- R.C combined footing
- R.C Water tank and retaining walls
- Multistory building under lateral loads

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Course Code	:	ME/CEOE 603
Course Title	:	Project Management
Number of Credits	:	3 (L:3, T:0, P:0)
Prerequisites	:	Construction Management (ME/CEOE 505)
Course Category	:	OE

Course Objectives:

Following are the objectives of this course:

- Analyze projects from marketing, operational and financial perspectives
- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

Course Content:

Unit- I: Concept of a Project

Classification of projects- importance of project management- The project life cycle establishing project priorities (scope- cost- time) project priority matrix- work break down structure.

Unit- II: Capital Budgeting Process

Planning- Analysis- Selection- Financing-Implementation- Review, Generation and screening of project ideas- market and demand analysis, Demand forecasting techniques. Market planning and marketing research process- Technical analysis

Unit- III: Financial Estimates and Projections

Cost of projects, means of financing, estimates of sales and production, cost of production, working capital requirement and its financing, profitability projected cash flow statement and balance sheet, Break even analysis.

Unit- IV: Basic Techniques in Capital Budgeting

Non discounting and discounting methods, payback period, Accounting rate of return, net present value, Benefit cost ratio, internal rate of return, Project risk, Social cost benefit analysis and economic rate of return, Non-financial justification of projects**.**

Unit V: Project Administration

Progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off, Concepts and uses of PERT cost as a function of time, Project evaluation and Review Techniques / cost mechanisms, determination of least cost duration, Post project evaluation, introduction to various Project management software.

References:

1. Prasanna Chandra, Project planning, analysis, selection, implementation and review, Tata McGraw Hill
2. Clifford F. Gray & Erik W. Larson, Project Management- the Managerial Process, Tata McGraw Hill
3. David I Cleland, Project management, Tata Mcgraw Hill International Edition
4. Gopala Krishnan, Project Management, Mc Millan India Ltd.
5. Harry Maylor, Project Management, Peason Publication

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Understand the importance of projects and its phases.
CO2	Analyze projects from marketing, operational and financial perspectives.
CO3	Evaluate projects based on discount and non-discount methods.
CO4	Develop network diagrams for planning and execution of a given project.
CO5	Apply crashing procedures for time and cost optimization.

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Course Code	:	CEHS 604
Course Title	:	Entrepreneurship and Start-ups
Number of Credits	:	3 (L:2, T:1, P:0)
Prerequisites	:	None
Course Category	:	HS

Course Objectives:

- To acquiring Entrepreneurial spirit, and resourcefulness.
- To understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
- To acquiring entrepreneurial quality, competency and motivation
- To eliminate unproductive activities under the control of the Management, Supervisor, worker and the Design of Products and Processes.
- To use the Charts to record the Activities of the people, materials and Equipment to find alternative methods which minimize waste and to implement the best method.

Course Content:

Unit- I Introduction to Entrepreneurship and Start-ups

Definitions, Traits of an entrepreneur, Entrepreneurship, Qualities to becomes entrepreneur, Motivation, Types of Business Structures, Similarities/differences between entrepreneurs and managers, Small Scale of industries, Business Ideas and their implementation, Business Plan.

Unit- II Idea to Start-ups

Market Survey, Project report, Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting, Risk analysis, Communication of Ideas to potential investors – Investor Pitch, Patenting and Licenses, exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy.

Unit- III Principles of Management

Definition of Management, Administration Organization, F.W. Taylor's and Henry Fayol's Principles of Management, Functions of Manager, Types of Organization: Line, Staff, and committee type, Directing, Leadership; Styles of Leadership; Qualities of a good leader; Motivation, Positive and Negative Motivation, Modern Management Techniques, Management Information Systems, Objectives and Importance.

Unit- IV Production Planning and Control

Introduction, Major functions of Production Planning and Control, Methods of forecasting, Concept of Critical Path Method (CPM), Types of Production: Mass Production, Batch Production and Job Order Production, Principles of Product and Process Planning, Quality Control, definition, objectives, Sampling Inspection, Benefits of ISO to the organization, Concept of ISO 9001:2008, Quality Management System, Registration/Certification.

Unit- V Financial Management

Financial Institutions, Financing methods available for start-ups in India, Fixed and Working Capital; Resources of Capital; Shares Preference and Equity Shares; Debentures; Public Deposits; Factory Costing: Direct Cost; Indirect Cost; Factory Overhead; Selling Price of a product; Profit.

References:

1. S.C. Sharma, Industrial Engineering & Management, Khanna Book Publishing Co. (P) Ltd., Delhi
2. O.P. Khanna, Industrial Engineering and Management, Revised Edition, Dhanpat Rai Publications (P) Ltd., New Delhi – 110002.
3. Steve Blank and Bob Dorf, K & S Ranch, The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company
4. Eric Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Penguin UK
5. Heinz Weihrich, Harold Koontz, Management, A global perspective, McGraw Hill International Edition 1994.
6. M. Mahajan, Industrial Engineering and Production Management, Dhanpat Rai & Co.

Course Outcomes:

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

CO 1	Understanding the concept and process of entrepreneurship
CO 2	Understand the ideas of start-up, finance and protection
CO 3	Explain the production planning and quality control, and its functions
CO 4	Understand the basic principles, approaches and functions of management and identify concepts to specific situations
CO 5	List and explain the different financial sources and methods of inventory management

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Course Code	:	CEPC 611
Course Title	:	Public Health Engineering Lab
Number of Credits	:	2 (L:0, T:0, P:4)
Prerequisites	:	Solid Waste Management (CEPE 405)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn the tests for measuring quality of drinking water.
- To learn determination of BOD and COD requirement in sewage.
- To understand the plotting of water supply scheme highlighting different features.

List of Practical to be performed:

1	Determine pH value of given sample of water.
2	Determine the turbidity of the given sample of water.
3	Determine residual chlorine in a given sample of water.
4	Determine suspended, dissolved solids and total solids of given sample of water.
5	Determine the dissolved oxygen in a sample of water.
6	Undertake a field visit to water treatment plant and prepare a report.
7	Determine the optimum dose of coagulant in a given raw water sample by jar test.
8	Draw sketches of various valves used in water supply pipe line
9	Draw a sketch of one pipe and two pipe system of plumbing
10	Determine B.O.D. of given sample of sewage.
11	Determine pH value of given sample of sewage.
12	Determine suspended solids dissolved and total solids for sample of sewage.
13	Determine the dissolved oxygen in the given sample of sewage.
14	Determine C.O.D. of given sample of sewage.
15	Prepare a report of a field visit to sewage treatment plant

References:

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering, Vol.I and Vol.II, Khanna Publishers
3. Birdie, G.S. and Birdie, J.S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House,

Delhi
5. Punmia, BC, Environmental Engineering, vol.I and II, Laxmi Publishers
6. Peavy HS, Rowe DR, and Tchobanoglous G, Environmental Engineering, Mc Graw

Course Outcomes:

After completing this course, student will be able to:

- Perform various tests to assess quality of water and estimate dissolved solids as per BIS codes.
- Measure BOD and COD of sewage sample and prepare report on a Sewage Treatment Plant
- Draw line diagram of water pipe line system for a locality.

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Course Code	:	CEPC 615
Course Title	:	Structural Engineering Software Lab
Number of Credits	:	2 (L:0, T:0, P:4)
Prerequisites	:	Design of Steel Structures (CEPE 501) Design of R.C.C Structures (CEPE 502)
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To understand the concept for analysis of Reinforced concrete and structural steel building by using structural engineering software
- To learn the design of R.C column footing by using structural engineering software
- To learn the design of steel roof truss by using structural engineering software

List of Practical: (Minimum 10 practicals to be performed)

1	Analysis of a single storey R.C framed building under gravity loads (DL+LL)by using Staad Pro / SAP / Etab software.
2	Analysis of a single storey structural steel framed building under loads DL+LL+WL by using Staad Pro / SAP / Etab structural engineering software.
3	Analysis of a single storey R.C framed building under loads DL+LL+EQL (Static Analysis) by using Staad Pro / SAP / Etab structural engineering software.
4	Analysis of a single storey R.C framed building under loads DL+LL+EQL (Dynamic Analysis) by using Staad Pro / SAP / Etab structural engineering software.
5	Analysis of a three storey R.C framed building under gravity loads (DL+LL)by using Staad Pro / SAP / Etab software.
6	Analysis of a three storey Structural steel framed building under loads DL+LL+WL by using Staad Pro / SAP / Etab structural engineering software.
7	Analysis of a three storey R.C framed building under loads DL+LL+EQL (Static Analysis) by using Staad Pro / SAP / Etab structural engineering software.
8	Analysis of a three storey R.C framed building under loads DL+LL+EQL (Dynamic Analysis) by using Staad Pro / SAP / Etab structural engineering software.
9	Analysis of a multistorey R.C framed building under loads DL+LL+EQL (Dynamic Analysis) by using Staad Pro / SAP / Etab structural engineering software.
10	Analysis of a multistorey structural steel framed building under loads DL+LL+WL by using Staad Pro / SAP / Etab structural engineering software.
11	Design of R.C. Isolated footing by using Staad Pro / SAP / Etab structural engineering software.
12	Analysis of a structure steel roof truss under DL+LL+WL by using Staad Pro / SAP / Etab structural engineering software.

13	Design of a structure steel roof truss by using Staad Pro / SAP / Etab structural engineering software.

References:

1. IS 456:2000- Plain and Reinforced Concrete Code of Practice, Bureau of Indian Standards, New Delhi
2. IS 1893: 2016 (Part 1)- Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi
3. IS 875- Code of Practice for Design of Loads (Other than Earthquake) for Buildings and Structures, Bureau of Indian Standards, New Delhi
4. IS 800:2007- General Construction in Steel, Code of Practice, Bureau of Indian Standards, New Delhi

Course Outcomes:

After completing this course, student will be able to:

- Use structural Engineering software and analyse R,C framed and Structural Steel Building
- Design R.C footing
- Design Steel roof truss

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Course Code	:	CESE 616
Course Title	:	Seminar
Number of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	SE

A Seminar course at diploma engineering level covers a range of topics within the civil engineering field including Estimating, Costing and Evaluation, structural design, construction management, geotechnical engineering, environmental engineering, transportation engineering and water resource management. The focus is on analysis and presentation of a chosen topic. The chosen activities should be as per curricular interest to students and of professional value to industrial field organizations. Each teacher is expected to supervise 8-10 students.

Guidelines:

The student may choose any topic for seminar presentation as below

- Water supply system for one or two villages: This may include Surveying, Design of water requirements and water distribution system
- Rain water harvesting: This may include assessment of catchment area, Intensity of rain fall, Collection of water,
- Design of septic tank with soak pits
- Preparing plumbing detailed drawings of a two storey building and material estimate & costing
- Design of small residential building including design of structural members,
- Quality control of materials
- Valuation of a buildings
- Pollution prevention and control studies
- Concrete Mix Design
- Manufacturing of Cement
- Design of foundations
- Testing of Beams
- Design of Highway Pavement
- Study of defects in buildings
- Soil Stabilization technique
- Preparations of bill of quantities (BOQ) and Tender documents.
- Preparation of Soil Reports
- Design of roof trusses in industrial buildings
- Analysis and Design of a R.C retaining wall

Course Code	:	CEPR 617
Course Title	:	Major Project - II
Number of Credits	:	3 (L: 0 T: 0 P: 6)
Prerequisites	:	Major Project- I (CEPR 517)
Course Category	:	PR

Course Objectives:

- Understand the method of applying engineering knowledge to solve specific problems.
- Apply engineering and management principles while executing the project.
- Identify and solve complex engineering problems using professionally prescribed standards and demonstrate good verbal presentation and technical report writing skills.

Guidelines:

1. Project will have to be done by a group in their area of interest.
2. Each group has to select a topic (may be an extension of Major Project- I) that will use the technical knowledge of their program of specialization.
3. Allocation of the guides preferably in accordance with the expertise of the faculty.
4. The student will be assigned a faculty guide who would be the supervisor of the student.
5. The number of projects that a faculty can guide would be limited to two groups.
6. The project can be carried out on-campus or in an industry / field or an organization with prior approval from the principal through head of section.
7. The project shall be completed and submitted at least a month before the last teaching day.
8. The project should be presented by students using power point once before submission of project.

Course Outcomes:

After going through this course, the student will be able to:

CO 1	Conceptualize, design and implement solutions for specific problems.
CO 2	Communicate the solutions through presentations and technical reports
CO 3	Apply project and resource managements skills, professional ethics, societal concerns

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Course Code	:	CEAU 600
Course Title	:	Indian Constitution
Number of Credits	:	0 (L:2, T:0; P:0)
Prerequisites	:	NIL
Course Category	:	AU

Course Contents:

Unit 1 – The Constitution

Introduction: The History of the Making of the Indian Constitution, Preamble and the Basic Structure, and its interpretation, Fundamental Rights and Duties and their interpretation, State Policy Principles

Unit 2: Union Government

Structure of the Indian Union, President – Role and Power, Prime Minister and Council of Ministers, LokSabha and RajyaSabha

Unit 3: State Government

Governor – Role and Power, Chief Minister and Council of Ministers, State Secretariat

Unit 4: Local Commission

District Administration, Municipal Corporation, ZilaPanchayat

Unit 5: Election Commission

Role and Functioning, Chief Election Commissioner, State Election Commission

References:

1. Rajeev Bhargava, Ethics and Politics of the Indian Constitution, Oxford University Press, New Delhi, 2008
2. B.L. Fadia, The Constitution of India, SahityaBhawan; New edition (2017)
3. DD Basu, Introduction to the Constitution of India, Lexis Nexis; Twenty-Third 2018 edition
4. https://www.constitution.org/cons/india/const.htm
5. http://www.legislative.gov.in/constitution-of-india
6. https://www.sci.gov.in/constitution
7. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india

Appendix I

List of Programme Elective Courses (PE)

S.No	Code No.	Course Title
1	CEPE501	Design of Steel Structures
2	CEPE502	Design of R.C.C Structures
2	CEPE ***	Precast and Prestressed Concrete
3	CEPE ***	Rural Construction Technology
4	CEPE405	Solid Waste Management
5	CEPE ***	Traffic Engineering
6	CEPE ***	Advance Construction Technology
7	CEPE ***	Building Services and Maintenance
8	CEPE ***	Pavement Design & maintenance
9	CEPE ***	Green Building and Energy Conservation
10	CEPE602	Advance Design of R.C.C Structures
11	CEPE ***	Repairs and Maintenance of Structures
12	CEPE ***	Tendering and Accounts

List of Open Elective Courses (OE)

S. No.	Course	Course Code
1	Construction Management	ME/CEOE505
2	Project Management	ME/CEOE605
3	Engineering Economics and Accountancy	CEOE###
4	Disaster Management	CEOE###
5	Sustainable Development	CEOE###
6	Renewable Energy Technologies	MEOE###
7	Soft Computing Techniques	EEOE###
8	Artificial Intelligence and Machine Learning	COOE###
9	Internet of Things	COOE###
10	Web Designing and Multimedia Technology	COOE###

Appendix II: Exit Policy

By implementing the guidelines of **NEP-2020**, if any student fails to continue with the diploma course of 3 year duration after passing 2nd year of the enrolled discipline of the course due to any reason/s, he/she may be awarded with a **Certificate** in the respective discipline of engineering.

The result for the same will be prepared according to the following table:

S.No.	**Year**	**Weightage**	**Maximum Marks**
1	First	25 Percent	500
2	Second	75 Percent	1500

Appendix III

Final Year Result Processing Methodology

S. No.	Year	Weightage	Maximum Marks
1	First	25 Percent	500
2	Second	75 Percent	1500
3	Third	100 Percent	2000
		Grand Total	**4000**