College of Technology and Engineering

REGULATIONS
AND
COURSE DESCRIPTION

BACHELOR OF TECHNOLOGY

Civil Engineering

Effective from 2019–20

Maharana Pratap University of Agriculture and Technology, Udaipur (Raj.) – 313 001

VISION OF CIVIL ENGINEERING DEPARTMENT

- The Department of Civil Engineering was established with a vision of creating a technical education centre of high standards and conducting research at the cutting edge of technology to meet the current and future challenges of technological development.

MISSION OF CIVIL ENGINEERING DEPARTMENT

- To offer high quality graduate and post graduate programs in Civil Engineering.
- To generate Competent Professionals to become part of the society/ Industry and Research Organizations at various levels.
- To provide necessary guidance and motivation to enable the Students to become Entrepreneurs.
- To promote Research and Development in the emerging and sustainable areas of Civil Engineering.
- To contribute our present skills to provide technical services to society/ Industry and to increase interaction with various engineering organizations.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO I: To provide students with a sound foundation in the science, mathematics, engineering and construction fundamentals. A graduate must be able to view construction practices as an integrated continuum of technologies and to engage in integrated system level design.

PEO II: To develop the analytical and logical aptitude among students to quickly adapt to new work environments, assimilate new information, and solve new problems related to the field of civil engineering.

PEO III: To provide exposure of new cutting edge technologies to the students and to motivate them to take up new challenges to solve the problems faced by society and nation through research and development related to the field construction.

PEO IV: To inculcate the nature of self-learning, discipline and leadership qualities with good communication skills in students and to introduce them to holistic approach of working in a team according to the codes of professional practice.

PROGRAM EDUCATIONAL OBJECTIVES (POs)

PO1	**Engineering Knowledge:** Apply knowledge of mathematics and science, with fundamentals of Computer Science & Engineering to be able to solve complex engineering problems related to CSE.

PO2	**Problem Analysis:** Identify, Formulate, review research literature and analyze complex engineering problems related to CSE and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	**Design/Development of solutions:** Design solutions for complex engineering problems related to CSE and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural societal and environmental considerations.
PO4	**Conduct Investigations of Complex problems:** Use research–based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, Select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to computer science related complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society:** Apply Reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the CSE professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the CSE professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply Ethical Principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary Settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large such as able to comprehend and with write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
PO12	**Life-Long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning the broadest context of technological change.

ACADEMIC REGULATIONS
(UNDER-GRADUATE COURSES)

SCHEME OF TEACHING AND EXAMINATION

(Civil Engineering)
First Year B.Tech. (Common for All Branches)

SEMESTER - I

S. N.	Cate-gory	Course Code	Course title	Credits			Hrs/ week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1	BSC	BS 111 (BSC)	Mathematics -I	2	1	0	2	1	0	80	0	20
2	ESC	ME 112 (ESC)	Mechanical Engineering	3	0	0	3	0	0	80	0	20
3.	ESC	ME 113 (ESC)	Workshop Practice	0	0	1.5	0	0	3	0	80	20
4	ESC	CE 114 (ESC)	Engineering Drawing	0	0	1.5	0	0	3	0	80	20
			NCC/NSS/NSO/ Yoga/Scout	-	-	-	0	0	2	-	-	-
			Total	**5**	**1**	**3**	**5**	**1**	**8**			
			GROUP I									
5.	BSC	BS 100P (BSC)	Engineering Physics	2	0	1	2	0	2	50	30	20
6.	ESC	CE 100 (ESC)	Engineering Mechanics	2	0	1	2	0	2	50	30	20
7.	ESC	EE 100 (ESC)	Electrical Engineering	3	0	1	3	0	2	50	30	20
8.	HSMC	REE100 (HSM)	Environmental Studies and Disaster Management	2	0	0	2	0	0	80	0	20
			Total	**9**	**0**	**3**	**9**	**0**	**6**			
			GROUP II									
5	BSC	BS 100C (BSC)	Engineering Chemistry	2	0	1	2	0	2	50	30	20
6.	ESC	EC 100 (ESC)	Electronics and Instrumentation	2	0	1	2	0	2	50	30	20
7.	ESC	CS 100 (ESC)	Computer Programming for Problem Solving	0	1	2	0	1	4	0	80	20
8.	HSMC	BS100E (HSM)	Communication Skills and Personality Development	2	0	1	2	0	2	50	30	20
			Total	**6**	**1**	**5**	**6**	**1**	**10**			
			Total Credits	**21**								

Note : 1. NCC/NSS/NSO/YOGA/SCOUT is compulsory non credit course and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

2. The courses BS 100P, CE 100, EE 100, REE 100, BS 100C, EC 100, CS 100 and BS 100E shall be offered in both the semesters. The students will be divided in two groups in I semester itself and shall remain in the same group in II semester as well. However, they have to opt all the eight courses in first year.

SEMESTER - II

S. N.	Cate-gory	Course Code	Course title	Credits			Hrs/ week			Marks allotted		
				L	T	P	L	T	P	Th.	Pr.	MT
1	BSC	BS 121 (BSC)	Mathematics -II	2	1	0	2	1	0	80	0	20
2	ESC	CE 122 (ESC)	Civil Engineering	1	0	1	1	0	2	50	30	20
3.	ESC	ME 123 (ESC)	Mechanical Drawing	0	0	1	0	0	2	0	80	20
4	ESC	ME 124 (ESC)	Workshop Technology	2	0	1	2	0	2	50	30	20
			NCC/NSS/NSO/ Yoga/ Scout	-	-	-	0	0	2	-	-	-
			Total	**5**	**1**	**3**	**5**	**1**	**8**			
GROUP I												
5	BSC	BS 100C (BSC)	Engineering Chemistry	2	0	1	2	0	2	50	30	20
6.	ESC	EC 100 (ESC)	Electronics and Instrumentation	2	0	1	2	0	2	50	30	20
7.	ESC	CS 100 (ESC)	Computer Programming for Problem Solving	0	1	2	0	1	4	0	80	20
8.	HSMC	BS100E (HSM)	Communication Skills and Personality Development	2	0	1	2	0	2	50	30	20
			Total	**6**	**1**	**5**	**6**	**1**	**10**			
GROUP II												
5.	BSC	BS 100P (BSC)	Engineering Physics	2	0	1	2	0	2	50	30	20
6.	ESC	CE 100 (ESC)	Engineering Mechanics	2	0	1	2	0	2	50	30	20
7.	ESC	EE 100 (ESC)	Electrical Engineering	3	0	1	3	0	2	50	30	20
8.	HSMC	REE100 (HSM)	Environmental Studies and Disaster Management	2	0	0	2	0	0	80	0	20
			Total	**9**	**0**	**3**	**9**	**0**	**6**			
			Total Credits	**21**								

Note :

1. NCC/NSS/NSO/YOGA/SCOUT is compulsory non credit course and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.
2. Students have to undergo in house practical summer training [Branch Code 239 (PSI)] of 15 days at the end of II semester and will be assessed in III semester.

SECOND YEAR B.TECH. (III SEMESTER)

S. N.	Course Code	Course title	Credits			Hrs./Week			Marks allotted		
			L	T	P	L	T	P	Th.	Pr.	MT
1	BS 231 (BSC)	Mathematics-III	2	1	0	2	1	0	80	0	20
2.	BS 232 (HSM)	Human Values	2	0	0	2	0	0	80	0	20
3.	CE 233 (ESC)*	Strength of Material	2	0	1	2	0	2	50	30	20
4.	CE 234 (ESC)	Fluid Mechanics	2	0	1	2	0	2	50	30	20
5	CE 235 (PCC)	Building Planning and Construction	3	0	1	3	0	2	50	30	20
6	CE 236 (PCC)	Building Drawing	0	0	1	0	0	2	0	80	20
7	CE 237(PCC)	Computer Aided Drawing	0	0	1	0	0	2	0	80	20
8	CE 238 (PCC)	Concrete Technology	2	0	1	2	0	2	50	30	20
9	CE 239 (PSI)	Training –I	0	0	1	0	0	0	0	100	0
10		NCC/NSS/NSO/ Yoga/ Scout	-	-	-	0	0	2	-	-	-
		Total Credits	**21**			**28**					

***Common for** CE, AE, EE, & MI

SECOND YEAR B.TECH. (IV SEMESTER)

S. N.	Course Code	Course title	Credits			Hrs/week			Marks allotted		
			L	T	P	L	T	P	Th.	Pr.	MT
1	BS241 (BSC)	Mathematics –IV	2	1	0	2	1	0	80	0	20
2	CS242 (ESC)	Principles of object oriented Programming	2	0	1	2	0	2	50	30	20
3	CE243 (ESC)	Disaster Mitigation and Management	2	0	1	2	0	2	50	30	20
4	CE244 (PCC)	Structural Analysis	3	0	1	3	0	2	50	30	20
5	CE245 (PCC)	Hydraulics & Hydraulic Machines	2	0	1	2	0	2	50	30	20
6	CE246 (PCC)	Geotechnical Engineering-I	3	0	1	3	0	2	50	30	20
7	CE247 (PCC)	Surveying – I	2	0	1	2	0	2	50	30	20
8	CE248 (PCC)	Transportation-I	3	0	1	3	0	2	50	30	20
9		NCC/NSS/NSO/ Yoga/ Scout	-	-	-	0	0	2	-	-	-
		Total Credits	**27**			**36**					

NCC/NSS/NSO/YOGA/SCOUT is compulsory non-credit course and the student will be assessed as satisfactory/ unsatisfactory at the end of IV semester.

Note: Students have to undergo a Practical Training-II of 30 days (In house/ Field) at the end of IV Semester for which assessment will be made at the beginning of next semester as CE359 (PSI).

THIRD YEAR B.TECH. (V SEMESTER)

S. N.	Course Code	Course title	Credits			Hrs/week			Marks allotted		
			L	T	P	L	T	P	Th.	Pr.	MT
1	CE351 (PCC)	Theory of Structures-I	3	0	1	3	0	2	50	30	20
2	CE352 (PCC)	Design of Concrete Structures-I	3	0	1	3	0	2	50	30	20
3	CE353 (PCC)	Geotechnical Engineering-II	2	0	1	2	0	2	50	30	20
4	CE354 PCC)	Design of Steel Structures -I	3	0	1	3	0	2	50	30	20
5	CE355 (PEC)	Surveying-II	3	0	1	3	0	2	50	30	20
6	CE356 (PCC)	Computer Application in Civil Engineering	0	0	1	0	0	2	0	80	20
7.	CE359 (PSI)	Training –II	0	0	3	0	0	0	0	100	0
		Total Credits	**23**			**26**					

THIRD YEAR B.TECH. (VI SEMESTER)

S. N	Course Code	Course title	Credits			Hrs./week			Marks allotted		
			L	T	P	L	T	P	Th.	Pr.	MT
1	CE361(PCC)	Design of Concrete Structures-II	3	0	1	3	0	2	50	30	20
2	CE362(PCC)	Public Health Engineering-I	3	0	1	3	0	2	50	30	20
3	CE363(PCC)	Water Resources Engineering	3	0	1	3	0	2	50	30	20
4	CE364(PCC)	Theory of Structures-II	3	0	1	3	0	2	50	30	20
5	CE365(PCC)	Design of Steel Structures –II	3	0	1	3	0	2	50	30	20
6	CE366(PCC)	Transportation Engineering-II	3	0	1	3	0	2	50	30	20
7	CE367(PEC)	Elective-I	2	0	1	2	0	2	50	30	20
		Total Credits	**27**			**34**					

Elective-I

CE367a (PEC) Project Evaluation and Construction Management

CE367b (PEC) Construction Economics and Finance

CE367c (PEC) Advanced Transportation Engineering

CE367d (PEC) Open Channel Hydraulics

CE367e (PEC) Rural Water Supply & Sanitation

CE367f (PEC) Advanced Foundation Engineering

Note:

(i) The students have to take one elective each out of the list given. However, the elective may not be offered if faculty expertise is not available or a minimum of 10 students do not opt for a particular elective.

(ii) Students have to undergo a Practical Training-III of 30 days (In house/ Field) at the end of VI Semester for which assessment will be made in the next semester as CE 479 (PSI).

FOURTH YEAR B.TECH. (VII SEMESTER)

S. N	Course Code	Course title	Credits			Hrs/week			Marks allotted		
			L	T	P	L	T	P	Th.	Pr.	MT
1.	CE471(PCC)	Estimating & Costing	2	0	1	2	0	2	50	30	20
2.	CE472(PCC)	Public Health Engineering-II	2	0	1	2	0	2	50	30	20
3.	CE473(PCC)	Irrigation Engineering and Hydraulic Structures	2	0	1	2	0	2	50	30	20
4.	CE474(PCC)	Bridge Engineering	3	0	1	3	0	2	50	30	20
5.	CE475(PEC)	*Elective-II	2	0	1	2	0	2	50	30	20
6.	**478 (OE)	**Open Elective	3/2	0	0/1	3/2	0	0/2	80/50	0/30	20
7.	CE479(PSI)	Training –III	0	0	3	0	0	0	-	100	-
		Total Credits	**22**			**24/25**					

Note: The students have to take one elective each out of the list given. However, the elective may not be offered if faculty expertise is not available or a minimum of 10 students do not opt for a particular elective.

* Elective-II

CE475a (PEC) Repair and Rehabilitation of Concrete Structures

CE475b **(PEC)** Tall Buildings

CE475c (PEC) Design of Pre-Stress Structures

CE475d (PEC) Design of Industrial Structures

CE475e (PEC) Earthquake Resistant Design of Structures

****OPEN ELECTIVE**

Note: The students have to take one open elective out of the list given below:

Offering Department	Course Code	Course Title	Credit		
			Th.	T	P
Computer Sc. Engg	CS 478 (OE)	Introduction to Cyber Security	3	0	0
Mining Engineering	MI 478 (a) (OE)	Engineering Geology	2	0	1
	MI 478 (b) (OE)	Earth Moving Machinery	2	0	1
	MI 478 (c) (OE)	Tunnelling Engineering	2	0	1
Mechanical Engineering	ME 478(a) (OE)	Entrepreneurship and Industrial Management	2	0	1
	ME 478(b) (OE)	Bio Energy System Design	2	0	1
	ME 478(c) (OE)	Energy Conservation and Management	2	0	1
Electronics & Comm. Engg.	EC 478(a)(OE)	Intellectual Property Rights	3	0	0
	EC 478(b) (OE)	E-Commerce	3	0	0
Electrical Engg.	EE 478(a) (OE)	Knowledge Based System	3	0	0
	EE 478(b) (OE)	Advanced Power Converters	3	0	0
	EE 478(c) (OE)	Power Electronics in Renewable Energy Systems	3	0	0
Renewable Energy Engineering	REE 478(OE)	Renewable Energy Technologies	2	0	1
Soil & Water Engg.	SWE 478(OE)	Aerial Photography, RS and GIS	2	0	1
Farm Machinery & Power Engineering	FMP 478(OE)	Machinery for Land Development	2	0	1
Processing & Food Engineering	PFE 478(OE)	Packaging Materials and Methods	2	0	1

FOURTH YEAR B.TECH. (VIII SEMESTER)

S. N	Course Code	Course title	Credits			Hrs/week			Marks allotted		
			L	T	P	L	T	P	Th.	Pr.	MT
1.	CE481 (PSI)	Seminar	0	0	3	-	-	-	0	100	0
2.	CE482 (PSI)	Project**	0	0	15	-	-	-	0	100	0
		Total Credits	**18**								

COURSE CONTENT

FIRST YEAR B.TECH. (I SEMESTER)

BS111 (BSC) MATHEMATICS – I

Cr. Hrs. 3 (2+1+0)

	L	T	P
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

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

CO1: Expand function in Taylor's and Maclaurin's series.

CO2: Trace the Cartesian and Polar curves.

CO3: Apply the partial differentiation to compute the minima and maxima of functions of two variables.

CO4: Compute areas and volumes by integration.

CO5: Solve linear differential equations of higher order and homogenous differential equations with constant coefficients.

Unit-I

Differential Calculus: Taylor's and Maclaurin's expansions, Asymptotes and Curvature (Cartesian Coordinates only), Curve tracing (Cartesian and standard Polar Curves-Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral).

Unit-II

Differential Calculus : Partial Differentiation, Euler's Theorem on Homogeneous Functions, Maxima & Minima of Two Independent Variables, Lagrange's Method of Multipliers, Jacobians.

Unit-III

Integral Calculus : Double Integral, Areas & Volumes by Double Integration, Change of Order of Integration, Triple integrals, Beta Function and Gamma Function (Simple Properties), Relation between Beta and Gamma functions.

Unit-IV

Differential Equations : Linear Differential Equations of Higher Order with constant coefficients, Homogeneous Linear Differential Equations with constant coefficient.

Text Books/ References

1. Guar, Y.N. and Koul, *C.L, Engineering Mathematics*, Vols. I & II, Jaipur Publishing House, Jaipur (2013).
2. Babu Ram, *Engineering Mathematics-I*, Pearson Education, India (2011).
3. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill, India (2012).
4. J.L. Bansal and H.S. Dhami, *Differential Equations*, Vols. I & II, Jaipur Publishing House, Jaipur (2012).
5. M.Ray and Chaturvedi, *A Text Book of Differential Equations*, Student Friend & Co. Publisher, Agra.
6. Rao V. Dukkipati, *Engineering Mathematics*, New Age International (P) Ltd, New Delhi (2012).
7. Gupta C.B., Malik A.K., *Engineering Mathematics –I,* New Age international Publisher.

ME 112 (ESC) MECHANICAL ENGINEERING

Cr. Hrs. 3 (3+0+0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

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

CO1: Apply the principles of conservation of mass, first and second laws of thermodynamics to analyse closed steady state systems and processes involving heat and work interactions.

CO2: Show understanding of concepts of reversibility, entropy and Carnot cycle.

CO3: Demonstrate knowledge of properties of steam and ability to compute them from steam tables and Mollier chart.

CO4: Understand construction and working of steam boilers, steam engines and their specific applications.

CO5: Compute efficiency, power output, etc. of various vapour and gas cycles.

CO6: Demonstrate knowledge about construction and working of IC engines.

Unit I

Thermodynamics: Thermodynamic properties, closed and open systems, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of First Law in heating and expansion of gases in non-flow processes only.

Second law of thermodynamics: Kelvin-Planck and Claussius statements. Reversible processes, Carnot cycle, Carnot theorem. Reversed Carnot cycle. Entropy, physical concept of entropy.

Unit II

Properties of Steam: Difference between gas and vapour, change of phase during constant pressure process. Generation of Steam, triple point and critical point. Internal energy and entropy of steam. Use of steam tables and Mollier chart, heating and expansion of vapour in non-flow processes.

Unit III

Vapour Power Cycles: Introduction to Carnot Cycle, Rankine cycle and modified Rankine cycle.

Steam Generators: Classification of steam boilers. Cochran, Lancashire, Locomotive and Babcock-Wilcox boilers, Boiler mountings and accessories.

Steam Engines: Introduction to simple and compound steam engines.

Unit IV

Gas Power Cycles: Introduction. Air Standard efficiency, other engine efficiencies and terms. Otto, diesel and dual cycles. Calculation of efficiency, mean effective pressure and their comparison.

Internal Combustion Engines: Introduction, Classification, terminology and description of IC Engines. Four stroke and two stroke petrol, gas and diesel engines. Comparison of petrol and diesel engines. Simple carburettor.

Text Books/References

1. M. L. Mathur and F. S. Mehta: Thermal Engineering, (Vol. I, SI Edition), Jain Brothers, New Delhi.
2. R. K. Purohit: Foundation of Mechanical Engineering, Scientific Pub. (India), Jodhpur.
3. P.K. Nag: Engineering Thermodynamics, TMH.

ME113 (ESC) WORKSHOP PRACTICE

Cr. Hrs. 1.5 (0 + 0 + 1.5)

	L	T	P
Credit	**0**	**0**	**1.5**
Hours	**0**	**0**	**3**

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

CO1: Demonstrate knowledge of characteristics of various types of woods used in engineering applications.

CO2: Demonstrate knowledge of tools and operations in carpentry work, black smithy, fitting, sheet metal and plumbing works in engineering practice.

CO3: Identify and use measuring instruments in workshop practice and pipe fittings.

CO4: Learn use of tools in the carpentry, fitting, smithy, sheet metal and plumbing shop to make simple jobs.

Carpentry Shop: Acquaintance with types of wood, tools and their uses. Simple exercises involving basic operations like sawing, planning, chiselling, etc. Preparation of simple joints, cross half lap joint, dovetail joint, bridle joint, tenon and mortise joint.

Smithy Shop: Acquaintance with types of tools and their uses. Simple exercises involving basic operations like bending, drawing, punching, shaping, upsetting, and riveting.

Fitting Shop: Acquaintance with tools, measuring and marking tools, precision measuring tools and their uses. Simple exercises involving

basic operations like sawing, chipping, filling, drilling, reaming, threading with taps and dies.

Sheet Metal and Plumbing Shop: Demonstration of basic tools, pipe fittings and operations.

Texts books/References

1. S.K. Hajra Choudhury and A.K. Hajra Choudhury: Elements of Workshop Technology (Vol. I), Media promoters & Publishers Pvt. Ltd., Bombay.

CE 114 (ESC) ENGINEERING DRAWING

Cr. Hrs. 1.5 (0+0+1.5)

	L	T	P
Credit	**0**	**0**	**1.5**
Hours	**0**	**0**	**3**

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

CO1: Select, Construct and Interpret appropriate drawing scale as per the situation.

CO2: Draw simple curves like ellipse, cycloid and spiral.

CO3: Draw Orthographic projections of points, lines and planes.

CO4: Draw orthographic projection of solids like cylinders, cones, prisms and pyramids including sections.

CO5: Layout development of solids for practical situations.

CO6: Draw isometric projections of simple objects.

Introduction and letter writing. Construction and use of plain, diagonal and vernier scale. Methods of drawing ellipse, parabola and hyperbola. Methods of drawing cycloids, spirals. Orthographic projection and projection of points.

Projection of lines, projection of planes, projection of solids. Introduction of prism, pyramid, cylinder and cone.

Section of solids, introduction of intersection of surfaces. Development of plane and curved surface. Isometric projection.

Text Books / Reference

1. N.D. Bhatt. Elementary Engg. Drawing, Rupalee publication, Anand.
2. Lakshmi Narayan and Vaishwanar. A Text Book of Practical Geometry, Jain Brother, New Delhi.
3. R.B. Gupta. A Text Book of Engineering Drawing, SatryPrakashan, New Delhi.
4. Fundamentals of Technical Drawing, Parkinson.

BS 100P (BSC) ENGINEERING PHYSICS

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Apply vector calculus approach to problems in electric field and magnetic field.

CO2: Apply laws of physics to simple LRC circuits.

CO3: Learn physics behind various types of lasers and their characteristics.

CO4: Understand the interference and diffraction from wave optics concepts and know its applications.

CO5: Understand polarization of light and its applications.

Unit-I

Electric Field: Line integral of electric field, Potential difference, Field as gradient of potential, Divergence of a vector function, Differential form of Gauss's law, Laplacian, Laplace equations, Curl of a vector function. Gauss's divergence theorem.

Magnetic Field: Curl and Divergence of a magnetic field, Magnetic scalar and vector potential.

Unit-II

Varying Field: Faraday's law-integral and differential form, Self and mutual inductance, Neumann's equation, Charge and discharge of a capacitor through register, Growth and decay of current in LR circuit, Energy stored in electric and magnetic field, Displacement current, Maxwell's equations.

Unit-III

Laser: Coherence, Einstein's coefficient, Spontaneous and stimulated emission, Population inversion, Laser gain (pumping), Spectral narrowing in laser, Coherence length, Ruby and He-Ne laser.

Interference: Division of amplitude, colour of thin films, Newton's ring, Febry-Perot interferometer-principle, operation, determination of wave length and difference in wave length.

Unit-IV

Diffraction: Double slit Fraunhoffer diffraction pattern, Fraunhoffer diffraction by a plane transmission grating, Formation of spectra.

Polarization: Analysis of linearly, circularly and elliptically polarized light (Half wave and quarter wave plates), Optical activity, specific rotations, Laurent's half shade polarimeter and its use for determination of specific rotation of sugar solution.

Practical

1. To find refractive index and dispersive power of material of prism by spectrometer.
2. To find wave length of light by Newton’s ring.
3. To find wave length of light by diffraction grating.
4. To find specific rotation of sugar solution by polarimeter.
5. To find wave length of light by Fresnel Biprism.
6. To find frequency of A.C. mains.
7. To determine dielectric constant of liquid using series resonance method.
8. To study charge and discharge of condenser through a resistor (C.R. Circuit).
9. To study LCR resonant circuit, resonance, quality factor and sharpness in (i) series circuit (ii) parallel circuit.

Text Books/References

1. K.K. Tiwari. (1995). Electricity and Magnetism, S. Chand and Company, New Delhi.
2. N. Subrahmanyam and Brijlal. (1993). A Text Book of Optics. S. Chand and Company, New Delhi.
3. Ahmed and Lal. (1966). Electricity, Magnetism and Electronics, Unitech House, Lucknow.
4. D.S. Mathur. (1993). Mechanics, S. Chand and Company, New Delhi.
5. Gupta and Kumar. (1995). Practical Physics, Pragati Prakashan, Meerut.

CE 100 (ESC) ENGINEERING MECHANICS

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Draw free body diagrams and determine the resultant of forces and/or moments.

CO2: Determine the centroid and second moment of area of sections.

CO3: Apply laws of mechanics to determine efficiency of simple machines with consideration of friction.

CO4: Analyse statically determinate planar frames.

CO5: Analyse the motion and calculate trajectory characteristics.

CO6: Apply Newton's laws and conservation laws to elastic collisions and motion of rigid bodies.

(A) STATICS

Unit-I

Introduction of condition of equilibrium: Force, system of force, coplanar forces.

Moment and couples: Moment and parallel forces, Couples, General conditions of equilibrium

Practical Applications: Levers, Cracked levers, Steel yards. Sagging chains and toggle joints.

Centre of Gravity: Centre of parallel forces, C.G. in some simple cases, C.G. of Solids.

Moment of Inertia: Moment of inertia, Radius of gyration and perpendicular axis. Determination of moment of inertia of simple sections. Mass of moment of inertia.

Unit-II

Friction: Introduction, Critical angle of friction, Friction on horizontal planes, Friction on inclined planes, Wedge and block, Screw Jack

Machines: Introduction, Effects of friction, Loss of work, Reversible and irreversible machine, Law of machine, Wheel and axle, Differential wheel and axle, Pulley block, Screw jack, Single and double purchase crab, Worm and Worm wheel, System of pulleys.

Frames: Statically determinate plane frames, Method of joints, Method of sections.

(B) DYNAMICS

Unit-III

Rectilinear Motion, Motion under gravity, Projectiles equation of the path, Maximum height attained, Time of flight, Horizontal range. Angle of projection, Projectile from a given height, Projectile on an inclined plane, Problems.

Work, Power and Energy: Work, Power, Work done by torque, Energy, Law of conservation.

Unit-IV

Centripetal and centrifugal forces, Laws of motion: Newton's Law of motion and their explanation, Collision of elastic bodies; Impulse and impulsive force, Principle of conservation of momentum, Loss of kinetic energy during impact.

Practical

1. Verification of law of polygon of forces.
2. Verification of principle of moment in case of compound level.

3. Verification of principle of moment in case of bell crack level.
4. Determination of reaction in case simply supported beam with or without overhang.
5. To determine coefficient of friction between different surfaces on horizontal plane.
6. To determine coefficient of friction between different surfaces in inclined plane.
7. Study of different wheel and Axle.
8. Study of single purchase crab.
9. Study of worm and worm wheel.
10. Study of Weston's pulley block.
11. Determination of mechanical advantage, velocity ratio and efficiency of single purchase crab.
12. Determination of mechanical advantage, velocity ratio and efficiency of double purchase crab.
13. Determination of mechanical advantage, velocity ratio and efficiency of first system of pulley.
14. Determination of mechanical advantage, velocity ratio and efficiency of second system of pulleys.
15. Determination of mechanical advantage, velocity ratio and efficiency of third system of pulleys Flywheel.

Text Books / References

1. I.B. Prasad. Engineering Mechanics, Khanna Publisher, New Delhi.
2. R.S. Khurmi. Applied Mechanics, S. Chand & Company Ltd., New Delhi
3. S.B. Junnarkar. Applied Mechanics, Charotar Publishing House, New Delhi.
4. Saluja. Applied Mechanics, SatyaPrakashan, New Delhi.

EE 100 (ESC) ELECTRICAL ENGINEERING

Cr. Hrs.	**4 (3+0+1)**		
	L	**T**	**P**
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Proficiency in solving DC network.

CO2: Know-how of single phase AC circuits

CO3: Competency in solving three phase balanced AC circuits

CO4: Dexterity in using basic electrical instruments

CO5: Comprehension of transformer working principles.

Unit-I

Electro motive force, reluctance, laws of magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, hysteresis and eddy current losses.

Kirchoff's law, Delta-star and star-delta conversion, source conversion

Network theorems: Thevenin's, Norton's, superposition, and Maximum Power Transfer theorem.

Unit-II

Single Phase EMF generation, average and effective values of sinusoidal and linear periodic wave forms, instantaneous and average power, power factor, reactive & apparent power, solution of R-L-C, series, parallel, series-parallel circuits, complex representation of impedances, phasor diagram, series and parallel resonance.

Unit-III

Transformer*:* Faraday's laws of Electromagnetic induction, construction and principle operation of single phase transformer, EMF equation, voltage and current relationship and Phasor diagram for ideal transformer.

Fundamentals of DC machines: Working principle, operation and performance of DC machines (Motor and generator).

Unit-IV

Three phase A.C. circuits: Three phase EMF generation, delta and star connection, methods of three phase power measurement; power factor, reactive and apparent power, Series and parallel resonance.

Concept of Three phase induction motor: construction and operation. Basic introduction of single phase induction motor.

Practical

1. To Establish the Voltage-Current Relationship in an Electric Circuit and to Measure the Unknown Resistance by Ammeter-Voltmeter Method (Ohm's Law).
2. Experimentally Verify the Number of Resistance Connected in Series and parallel in an Electric Circuit can be replaced by in Equivalent Resistance without Disturbing the Circuit Condition.
3. Verify Kirchhoff's Current Law and voltage law for a DC Circuit.
4. Verify Superposition Theorem For A DC Circuit.
5. Verify Thevenin's Theorem for a Dc Circuit.
6. To Measure Power and power factor in a Single Phase A.C. Series R-L Circuit.
7. Determination of Choke Coil Parameter Resistance (R) and Inductance (L).
8. To Study The Characteristics of an L-C-R Series Circuit.
9. Testing of Single Phase Energy Meter by Direct Loading Method.
10. Determination of Percentage Regulation of a Single Phase Transformer by Direct Loading Method.
11. Determination of Efficiency of a Single Phase Transformer By Direct Loading Method.
12. To perform open circuit and short circuit test for single phase transformer.
13. To obtain load characteristics of D.C. shunt/series /compound generator.
14. To perform no-load & blocked –rotor tests on 3 ph. Induction motor to obtain equivalent circuit parameters.
15. To perform no load & blocked –rotor test on 1 ph. induction motor & to determine the parameters of equivalent circuit.

Text Books / References

1. B.L. Therja. Electrical Technology, S. Chand.
2. M.E. Van Valkenberg. Network analysis, PH.I
3. Soni and Gupta. Introduction to Electrical Network Theory, Dhanpat Rai Publisher.
4. Dr. R.A. Gupta and Dr. Nikhal Gupta. (2002). Fundamentals of electrical & Electronics Engineering, JPH.
5. H.P. Tiwari. (2002). Electrical & Electronics Engineering, College Book Centre, Jaipur.
6. J. B. Gupta. (2002). Fundamentals of Electrical & Electronics. S.K. Kataria and Sons. Dehli.

REE 100(HSM)

ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

Cr. Hrs. 2 (2+0+ 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**0**	**0**

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

CO1: Develop an understanding of different natural resources including renewable resources.

CO2: Realize the importance of ecosystem and biodiversity for maintaining ecological balance.

CO3: Develop an understanding of environmental pollutions and hazards due to engineering/technological activities and general measures to control them.

CO4: Demonstrate an appreciation for need for sustainable development and role of science.

CO5: Aware of important acts and laws in respect of environment.

Unit-I

Environmental Studies: Definition, scope and importance. Natural Resources: Renewable and non-renewable resources and associated problems.

Forest resources: Use and over-exploitation. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects. Food resources: World food problems, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.

Unit-II

Ecosystems: Concept, Structure and function. Energy flow in an ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the various ecosystems.

Biodiversity and its conservation: Introduction, definition, genetic species & ecosystem diversity and biogeographical classification of India.

Value of biodiversity. Biodiversity at global, national and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation.

Unit-III

Environmental Pollution: definition, cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

Solid Waste Management: causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Social Issues and the Environment: Urban problems related to energy; Water conservation, rain water harvesting, watershed management.

Environmental ethics: Issues and possible solutions; Wasteland reclamation, Consumerism and waste products. Environment Protection Act.

Issues involved in enforcement of environmental legislation. Public awareness, Human Population and the Environment: population growth, Family Welfare Programme.

Environment and human health: Human Rights, Value Education, HIV/AIDS, Women and Child Welfare.

Role of Information Technology in Environment and human health.

Unit-IV

Natural Disasters- Meaning and nature, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, accidents.

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Armed forces in disaster response; Disaster response; Police and other organizations.

Text Books / References

1. Agarwal K.C., Environmental Biology, Nidi Publications, Bikaner, 2001.
2. Bharucha Erach. 2005. Text Book of Environmental Studies for Undergraduate Courses, University Grants Commission, University Press, Hyderabad.
3. Chary Manohar and Jaya Ram Reddy. 2004. Principles of Environmental Studies, BS Publishers, Hyderabad.
4. Chaudhary, B.L. and Jitendra Pandey: Environmental Studies, Apex Publishing House, Udaipur, 2005
5. Climate Change.1995: Adaptation and mitigation of climate change-Scientific Technical Analysis Cambridge University Press, Cambridge.
6. Gupta P.K. 2004, Methods in Environmental Analysis – Water. Soil and Air. Agro bios, Jodhpur.
7. Husain Majid. 2013, Environment and Ecology: Biodiversity, Climate Change and Disaster Management, online book.
8. Jhadav, H. & Bhosale, V.M.: Environmental Protection & Laws, Himalaya Pub. House, Delhi.

9. Kaul S.N., Ashuthosh Gautam. 2002. Water and Waste Water Analysis, Days Publishing House, Delhi.

10. Rao, M.N. and A.K. Datta, Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd.

11. Sharma J.P. 2003, Introduction to Environment Science, Lakshmi Publications.

12. Sharma, B.K., Environmental Chemistry, Goel Publishing House, Meerut

13. Sharma, R.K. & Sharma, G. 2005, Natural Disaster, APH Publishing Corporation, New Delhi.

14. Singh Pratap, N.S. Rathore and A.N. Mathur: Environmental Studies, Himanshu Publications, Udaipur, 2004.

15. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno Science Publications.

BS 100C (BSC) ENGINEERING CHEMISTRY

Cr.Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Demonstrate knowledge of science behind common impurities in water and methods to treat them.

CO2: Describe the purpose and operational steps of key water treatment processes used to improve water quality including: Coagulation, Sedimentation, Filtration, Disinfection, Corrosion Control, Taste and Odour Control

CO3: Know the methods to determine the calorific value of fuels, perform flue gas analysis and combustion analysis.

CO4: Apply the science for understanding corrosion and its prevention.

CO5: Apply the knowledge of Kinetics of Reactions

Unit- I

Sources of water, common impurities, requisites of drinking water in municipal water supply. Purification of water, sterilization, break point chlorination. Hardness, determination of hardness by Complexometric (EDTA) method, degree of hardness, Boiler troubles, carry over corrosion, Sludge and scale formation. Caustic embrittlement, cause of boiler troubles and their prevention.

Unit- II

Classification of fuels, solid fuels, Proximate and Ultimate analysis of coal, significance of constituents, theoretical method for calculation of Gross and net calorific values. Liquid fuels- Petroleum origin, Refining of Petroleum, knocking, octane number, anti knocking agents . Flue gas analysis by Orsat Apparatus, Calculations based on combustion.

Unit- III

Corrosion and its control: Definition and significance of corrosion, Mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion.

Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.

Unit- IV

Chemical Kinetics-Order and Molecularity of reaction, first and second order reaction, Derivation of equations for first and second order reaction, determination of order of reaction, Energy of activation and Arrhenius equations, Numerical of first and second order reactions.

Practical

1. Determination of viscosity of a liquid.
2. Estimation of free chlorine in a water sample.
3. Determination of temporary and permanent hardness by EDTA method.
4. Determination of Copper Sulphate iodometrically.
5. Estimation of Potassium dichromate iodometrically.
6. Determination of purity of Ferrous Ammonium Sulphate (Mohr's Salt) using Potassium Permanganate.
7. Estimation of available chlorine in Bleaching Powder sample.

8. Analysis of Brass.
9. Determination of Strength of Ferrous Ammonium Sulphate (FAS) using Potassium Ferricyanide as an external indicator.
10. Analysis of Common Salt.

Text Books / References

1. Jain and Jain. Engineering Chemistry, Dhanpat Rai Publishing Company(P) Ltd., New Delhi.
2. Jain and Gupta. A Text Book of Engineering Chemistry,Jaipur Publishing House,Jaipur
3. B.K. Sharma. Engg. Chemistry(General), Krishna Prakashan Media (P) Ltd., Merrut.
4. S.S. Dara. A Text Book of Engineering Chemistry, S.Chand & Co., New Delhi.
5. M.M. Uppal. A Text Book of Engineering Chemistry,Khanna Publishers, New Delhi.
6. S.S. Dara. A Text Book on Experiments and Calculations in Engg.Chem.

   S.Chand & Co., New Delhi.
7. Ameta and Yasmin. Practical Engineering Chemistry, Himanshu Publications, New Delhi

EC100 (ESC) ELECTRONICS AND INSTRUMENTATION

Cr.Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Unit-I

Passive Components: Construction and characteristics of various types of resistors, capacitors & inductors for electronic circuits, color coding of resistors. Semiconductor Devices: Basic theory of semiconductors, constructions and characteristics of PN diode, Zener diode, photodiode, LED, BJT & JFET.

Unit-II

Bipolar Junction Transistor: Introduction to BJT biasing circuits, Basic concept of class-A, class-B, class-AB, class-C amplifiers.

Power supply: Rectifier circuits and filters. Concept of voltage regulators, Zener diode voltage regulators, Transistor series regulator.

Unit-III

Feedback & Oscilloscopes: Concept of positive and negative feedback. Introduction to Oscilloscope.Barkhausen criteria. Working principle of RC-phase shift, Wien bridge, Hartley, Colpitts and Crystal Oscilloscopes.

Unit-IV

Transducers: Active and Passive transducers. Working principle of Thermocouple, LVDT, Strain Gauge and Tacho Generator. Instrumentation: Introduction to data acquisition system. Working principle of Electronic Multimeter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope and Spectrum Analyzer.

Practical

1. Identification and testing of different types of passive and active electronic components: Resistors, Capacitors, Inductors, Diodes, Transistors.
2. Plot the V-I characteristics in forward and reverse bias mode for (a) PN junction diode, (b) ZENER diode and find the cut- in and breakdown voltage respectively.
3. Plot the V-I characteristics of LED diode in forward bias mode and find the glow voltage.
4. Determine the R.M.S value of output voltage and check the waveform on CRO for:

   (a) Half wave rectifier with and without filter.

   (b) Full wave centre tapped rectifier with and without filter.

   (c) Full wave bridge rectifier with and without filter.
5. Plot the input and output characteristics for two configurations of transistors:

   (a) NPN/PNP transistor in CE configuration.

   (b) NPN/PNP transistor in CB configuration.
6. Determine both theoretically and practically the frequency of oscillation for R-C Phase shift Oscilloscope.

7. Determine the output voltage of an amplifier: (a) with feedback (b) without feedback.
8. Study and perform basic measurement of Digital Multi Meter.
9. Study and perform basic measurement of Cathode Ray Oscilloscope/ Digital Storage Oscilloscope.
10. Study of Spectrum Analyzer and perform basic measurements.

NOTE: *The actual number of experiments may be more than the above mentioned list.*

Text Books / References

1. Millman and Halkias. Integrated electronics: Mc Grew Hill
2. W.D Cooper. Electronics Instrumentation and Measurement : PHI
3. M.L.Gupta. Electrical Engineering Materials
4. Melvin,o Principles of Electronics
5. John D. Ryder. Electronics Fundamentals

CS100(ESC)
COMPUTER PROGRAMMING FOR PROBLEM SOLVING

Cr. Hrs. 3(0+1+2)

	L	T	P
Credit	**0**	**1**	**2**
Hours	**0**	**1**	**4**

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

CO1: Design, implement, test, debug, and document programs in C using conditional branching and iteration.

CO2: To use arrays, understand how to write and use functions, how the stack is used to implement function calls, and parameter passing options.

CO3: Implement recursion functions & use of pointers and structures to formulate programs.

CO4: To be able to create, read and write to/from files and to write simple searching and sorting algorithms.

Unit I

Introduction to Programming, Algorithm, Flowchart, Arithmetic expressions and precedence: The Character set, constants, variables and keywords, data types, Type Conversion, Hierarchy of Operations, Conditional Branching: The if Statement, if-else Statement, Nested if-else, Ladder if-else, The Conditional Operators. Loops: While Loop, do-while loop, for Loop, Nesting of Loops, Multiple Initializations in for Loop, break Statement, continue Statement, Decisions using switch, Go to Keyword, finding roots of an equations.

Unit II

Arrays: Array Initialization, Bounds Checking, One and Two Dimensional Arrays, Memory Map of a 2-Dimensional Array, Strings: String Functions- strlen( ), strcpy( ), strcat( ), strcmp( ), Two-Dimensional Array of Characters. Function: Function Declaration and Prototypes, Parameter passing in functions: Call by Value and Call by Reference, Passing Array Elements to a Function, Passing an entire Array to a Function.

Unit III

Recursion: Recursion such as Finding Factorial, Fibonacci series, Ackerman function etc. Structures: Declaring a Structure, Array of Structures. Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures

Unit IV

File handling: create, open, insert, update, search and display operations. Basic Algorithms: Searching: linear & binary, Basic Sorting Algorithms (Bubble, Quick sort and Merge sort), Notion of linked list.

Text books / References

1. “Let us C”, Yashwant Kanetkar, Allied Publishers.
2. “The C programming language”, Kernighan and Ritchie, Prentice Hall of India.
3. “Programming in ANSI C”, E. Balaguruswamy, Tata McGraw Hill.

BS100E (HSM)

COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Cr. Hrs. 3 (2 + 0 +1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand basic grammar principles, and apply them to synthesise and transform sentences and identify common errors in writing

CO2: Demonstrate enhanced communicative ability in English, and develop sensitivity to cultural differences in communication

CO3: Write structured paragraphs and essays, CVs, letters and professional emails

CO4: Understand their personality type, develop leadership qualities and time-management techniques

CO5: Understand the process and types of communication and the barriers to effective communication

CO6: Show improved vocabulary and pronunciation

CO7: Practice skills required for oral presentations, group discussions and interviews

Unit-I

Sentence and its types, Parts of Speech, Articles, Tenses, Concord, Modals, Narration and Voice

Unit-II

Nissim Ezekiel – Goodbye Party for Miss Pushpa T.S. – Poem (Introduction to Indianisms and Difference between Indian English and Standard English).

George Orwell – Politics and the English Language – Essay (Writing process and what constitutes good or bad writing; rules of writing for effective communication).

Unit-III

C.V and Resume Writing, Letter Writing, E-mail Writing, Paragraph Writing (Topic sentence, inductive and deductive logic), Essay Writing (Narrative, Descriptive, Expository and Persuasive).

Unit-IV

Personality Traits (Big Five Model), *Skills of a Good Leader,* Effective Time Management Techniques, Communication: Process and Types (Verbal/Non-Verbal/Para-Verbal, Intrapersonal/Interpersonal, Upward/ Downward/Horizontal/Diagonal), Barriers to Effective Communication

Practical (Language Lab)

Phonetics, Group Discussions, Mock Interviews, Presentations, Vocabulary Building (Synonyms, Antonyms, One-Word Substitutes, Idioms and Phrases), Listening Comprehension, Everyday Conversations.

Text books / References

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan. 2007.
3. High School English Grammar and Composition. Wren and Martin. S. Chand. 2018.
4. On Writing Well. William Zinsser. Harper Resource Book. 2001.
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.
8. The Ultimate Book of Common Errors. Terry O'Brien. Rupa Publications. 2015.

9. Technical Writing for Engineers and Scientists. Barry J. Rosenberg. Addison-Wesley Professional. 2005.
10. Spoken English: A Manual of Speech and Phonetics. R.K. Bansal & J.B. Harrison. Orient Longman. 2013.
11. English Phonetics & Phonology: A Practical Course. P. Roach. Cambridge University Press, London. 2010.
12. Handbook of the International Phonetic Association: A Guide to the Use of the International Phonetic Alphabet. Cambridge University Press.
13. Communicating Your Way to Success: The Success Stories. Dale Carnegie. Manjul Publishing House. 2018.
14. Talk like TED: The Public-Speaking Secrets of the World's Top Minds. Carmine Gallo. St. Martin's Press. 2014.
15. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Gopalaswamy Ramesh and Mahadevan Ramesh. Pearson Education. 2013.

FIRST YEAR B.TECH. (II SEMESTER)

BS121 (BSC) MATHEMATICS – II

Cr. Hrs.	**3(2+1+0)**		
	L	**T**	**P**
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

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

CO1: Show knowledge of vector calculus and its applications in engineering.

CO2: Solve second order differential equations for application in their field of engineering.

CO3: Solve partial differential equations of first order and higher orders (with constant coefficients).

CO4: Solve simultaneous equations by matrix methods.

CO5: Determine eigenvalues and eigenvectors.

CO6: Diagonalise a matrix and invert a matrix.

Unit-I

Vectors Calculus: Scalar and Vector field, Differentiation of vector functions, Gradient, Divergence, Curl and Differential Operator, Integration of vector functions, Line, Surface and volume Integrals, Green's Theorem in a Plane, Gauss's and Stoke's Theorem (without proof) and their Applications.

Unit-II

Differential Equations: Second Order Ordinary Differential Equations with Variables Coefficients, Exact Forms, Part of Complimentary Function is known, Change of Dependent Variable, Change of Independent Variable, Normal Forms, Method of Variation of Parameter.

Unit-III

Partial Differential Equations: Formation of partial differential equations, Partial Differential Equations of First Order, Lagrange's Form, Standard Forms Higher order linear partial differential equations with constant coefficients.

Unit-IV

Matrices: Rank of a matrix, Inverse of a matrix by elementary transformations, Consistency and Solution of simultaneous linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof), Diagonalization of matrix.

Text Books / References

1. Guar, Y.N. and Koul, C.L.(2013), *Engineering Mathematics,* Vols I and ll, Jaipur Publishing house.
2. Bansal, J.L. and Dhami, H.S.(2012), *Differential Equation* Vols I and ll, Jaipur Publishing house.
3. Babu Ram (2011), *Engineering Mathematics –I*, Pearson Education India.
4. B. V. Ramana (2012), *Heigher Engineering Mathematics*, Tata McGrew Hill, India.
5. M. Ray and Chaturvedi*, A text book of Differential Equation*, Student Friend & Co. Publisher, Agra.
6. Rao V. Dukkipati (2012), *Engineering Mathematics*, New Age International (p) Ltd., New Delhi.
7. Gupta C.B., Malik A.K., *Engineering Mathematics –II,* New Age international Publisher.

CE 122 (ESC) CIVIL ENGINEERING

Cr. Hrs. 2(1+0+1)

	L	T	P
Credit	**1**	**0**	**1**
Hours	**1**	**0**	**2**

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

CO1: Demonstrate knowledge of various surveying methods.

CO2: Conduct a compass survey.

CO3: Conduct levelling survey and be able to do RL calculations.

CO4: Demonstrate knowledge of properties of various building materials.

CO5: Plot work profile.

(A) SURVEYING AND LEVELING

Unit-I

Principle and purpose of plane surveying.

Introduction of Chain Surveying: Instrument for chaining, Direct & indirect ranging. Introduction of laser based distance measurement

*Compass Surveying:*True & Magneticmeridian, whole circle bearing &quadrantal bearing system, construction & use of Prismatic & Surveyor Compass, Local attraction.

Introduction of plane table Surveying: Accessories and working operation.

Unit-II

Level and leveling: Definition of various terms used in leveling. Types of Bench mark and their uses. Construction and use of Dumpy level, Leveling staves. Temporary adjustment of Dumpy level. Simple, differential leveling, fly leveling, longitudinal and cross sectioning, plotting of profile leveling. Determination of level by line of collimation and rise and fall method, Arithmetical checks. Level book and record keeping, leveling difficulties and errors in leveling.

(B) BUILDING MATERIAL

Unit-III

Stones: Different types, properties of good building stones, common testing of stones, Dressing of stones and use of stones in construction.

Bricks: Types, raw materials, identification, composition. Properties and uses of ordinary bricks, fire resistant and chemical resistant bricks.

Limes: Definition, sources of lime, slaking of lime, ISI classification of lime.

Unit-IV

Cement: Chemical composition, types of cement, properties, uses and tests on cement.

Mortars: Proportioning, properties of ingredients and use of lime, cement and gauge mortars.

Cement Concrete: Ingredients, common proportions, properties of fresh hardened concrete, Water cement ratio, curing and compaction of concrete.

*Timber :*Properties of good quality timber. Decay and preservation of timber.

Practical

1. Study of accessories used in measurement of distances.
2. Ranging Direct and indirect and use of chain and tape.
3. Study of prismatic compass and taking bearings..
4. Study of Dumpy level, temporary adjustment and R.L. calculations.
5. Simply and differential leveling operation, record in level book, practice for staff reading line of collimation and Rise and fall method calculations.
6. Longitudinal sectioning.
7. Cross sectioning.
8. Fly leveling operation.
9. Plotting of working profile.
10. Introduction of laser based distance measurement.
11. Properties of good quality bricks.
12. Properties of good quality stone.
13. Properties of good quality timber.
14. Physical test of cement.

Text Books / References

1. S.C. Rangwala. Engineering Materials, Charotar Book Stall, Anand.
2. B.C. Punmiya. Surveying & Field Work (Vol. I), Laxmi Publications, New Delhi.
3. Kanetkar T. P., 'Surveying and leveling', Vol. I & II.
4. Duggal S. K., 'Text book-Surveying', Vol. I & II.

ME123 (ESC) MECHANICAL DRAWING

	Cr. Hrs.	1(0+0+1)	
	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**2**

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

CO1: Demonstrate knowledge of conventional representation employed in machine drawing.

CO2: Make detailed drawings of simple machine parts in first/third angle projection by proper choice of sectioned views as per need.

CO3: Read, interpret and visualize machine parts from a given drawing.

CO4: Demonstrate knowledge of riveted, welded, threaded and screwed joints and fastenings.

Introduction, conventional representation of different materials used in machine drawing, Introduction to BIS codes.

Orthographic Projection: First and third angle methods of projection. Preparation of working drawing from models and isometric views. Drawing of missing views.

Dimensioning: Different methods of dimensioning.

Sectional Views: Concept of sectioning. Revolved and oblique section. Sectional drawing of simple machine parts

Riveted and Welded Joints: Types of rivet heads and riveted joints. Processes for producing leak proof joints. Symbols for different types of welded joints.

Screw Fastenings: Nomenclature, thread profiles, multistart threads, left and right hand threads. Square headed and hexagonal nuts and bolts. Conventional representation of threads. Different types of lock nuts, studs, machine screws, cap screws and wood screws. Foundation bolts.

Different types of joints: Knuckle joint, cotter joint and universal joint.

Text Books / References

1. N. D. Bhatt. Machine Drawing, Charotar Book Stall, Anand.
2. V. Laxminarayan and ML Mathur. A Text Book of Machine Drawing, Jain Brothers, New Delhi.
3. P. S. Gill. Machine Drawing, S. K. Kataria & Sons, New Delhi.

ME124 (ESC) WORKSHOP TECHNOLOGY

	Cr. Hrs.	3(2+0+1)	
	L	**T**	**P**
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand welding principles, equipment and tools of arc-, gas and resistance welding, brazing and soldering.

CO2: Describe construction, operations and tools of lathe, shaper and drilling machines.

CO3: Understand basic hot and cold forming operations.

CO4: Demonstrate knowledge of types of patterns, cores, moulding sands and tools.

CO5: Understand sand, permanent mould and investments castings and casting defects.

Unit I

Welding: Introduction to types of welding. Principle of electric arc welding, welding tools and safety devices, welding positions, welding joints, types of welds, Resistance welding. Oxyacetylene gas welding, types of flames. Soldering and Brazing.

Unit II

Lathes: Constructional details of centre lathe. Main operations and tools used on centre lathes.

Shaper: Types of shapers. Constructional details of standard shaper, shaper tools and main operations.

Unit III

Drilling Machines: Types of drilling machines. Constructional details of pillar type and radial drilling machines. Main operations. Twist drills, drill angles and sizes.

Forming: Basic descriptions and applications of hot and cold working processes, forging, bending, shearing, drawing and forming operations.

Measurement and Inspection: Classification of measuring instruments, linear and angular measurement, comparators.

Unit IV

Foundry & Casting Practices: Introduction, types of patterns, Mouldings, moulding materials, cores, moulding tools and equipments. Moulding sands, properties of moulding sands. Casting defects. Casting methods: Permanent mould casting, investment casting.

Practical

Practical exercises on welding, pattern making, foundry and machining operations.

Text Books / References

1. Mathur Mehta and Tiwari: Elements of Mechanical Engineering, Jain Brothers, New Delhi.
2. S.K. Hajra Choudhury and A.K. Hajra Choudhury: Elements of Workshop Technology (Vol. I and II), Media promoters & Publishers Pvt. Ltd., Bombay.

SECOND YEAR B.TECH. (III SEMESTER)

BS231 (BSC) MATHEMATICS – III

Cr. Hrs. 3 (2 + 1 + 0)

	L	T	P
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

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

CO1: Understand Finite differences, various difference operators and their relationships, factorial notation.

CO2: Use numerical methods in modern scientific computing.

CO3: Find the Inverse Laplace Transform by Partial Fractions.

CO4: Use the Laplace Transform to solve differential equation with constant coefficients.

CO5: Numerically integrate any function by Trapezoidal and Simpson's rule.

Unit-I

Interpolation: Finite differences, various difference operators and their relationships, factorial notation, Interpolation with equal intervals, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula for unequal intervals.

Unit-II

Gauss forward and backward interpolation formulae, Stirling's and Bessel's central difference interpolation formulae.

Numerical Differentiation: Numerical differentiation based on Newton's forward and backward, Gauss forward and backward interpolation formulae.

Unit-III

Numerical Integration: Numerical integration by Trapezoidal, Simpson's rule.

Numerical Solutions of Ordinary Differential Equations: Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta methods.

Unit-IV

Laplace Transform: Laplace transforms of elementary functions, Basic properties of Laplace transform, Initial value theorem, final value theorem and convolution property of Laplace transform, Inverse Laplace transforms, Applications of Laplace transform to solve ordinary differential equations.

Text Book/ References

1. H.C. Saxena, *Text Book of Finite Differences and Numerical Analysis*, S. Chand and Co.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering computation*, New Age International (P) Ltd.
3. N.P. Bali and Manish Goyal, *A Text book of Engineering Mathematics*, Laxmi Publication Pvt. Ltd., New Delhi (VII Edition).
4. S.P. Goyal and A.K. Goyal, *Integral Transforms*, Jaipur Publishing House, Jaipur.
5. Bansal, Bhargava, *Numerical Analysis*, JPH, Jaipur.

BS232 (HSM) HUMAN VALUES

Cr. Hrs. 2 (2 + 0 + 0)

	L	T	P
Credit	**2**	**0**	**0**
Hours	**2**	**0**	**0**

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

CO1 Distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.

CO2 Engage in a process of self-reflection and know what they 'really want to be' in their life and profession

CO3 Understand the meaning of happiness and prosperity for a human being.

CO4 Understand harmony at all the levels of human living, and live accordingly.

CO5 Apply the understanding of harmony in existence in their profession, develop commitment and courage to act in order to lead an ethical life.

Unit - I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for value education; Self Exploration - content and process; 'Natural Acceptance' and Experiential Validation; Continuous Happiness and Prosperity with respect to Human Aspirations; Method to fulfil human aspirations: understanding and living in harmony at various levels

Unit - II

Understanding Harmony in the Human Beings and their Relationships - Harmony in Myself, Family and Society

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'; Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha; Understanding the Body as an instrument of 'I' ,Understanding the characteristics and activities of 'I' and harmony in 'I'; Understanding the harmony of I with the Body: Sanyam and Swasthya;

Understanding harmony in the Family; Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman);

Understanding harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family

Unit-III

Understanding Harmony in Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature; Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature; Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all pervasive Space; Holistic perception of harmony at all levels of existence

Unit - IV

Implications of the above - Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and

Humanistic Universal Order; Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, and develop appropriate technologies and management models; Strategy for transition from the present state to Universal Human Order at the level of individual and society

Note: In each unit, relevant practice exercises and case studies to be taken up. Mode of conduct should be through group discussions.

Text Books/ References

Textbook:

R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2009. ISBN: 978-9-350-62091-5.

Other reference books:

1. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Annie Leonard, 2010, The Story of Stuff, Free Press
4. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
5. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press.
6. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
7. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
8. A Nagraj, 1998, Jeevan Vidya: Ek Parichay, Divya Path Sansthan, Amarkantak.
9. A N Tripathy, 2003, Human Values, New Age International Publishers.
10. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co.

13. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

CE 233 (ESC)* STRENGTH OF MATERIAL

Cr. Hrs. 3 (2+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Analyze behavior of materials under simple stress and strains

CO2: Analyze behavior of materials under compound stress and strains

CO3: Analysis of stress and strains by various methods, stresses in thin cylinder and special shells

CO4: Plot SFD and BMD of beams under various loading and determine shearing and bending stresses

CO5: Analyze various shafts under torque

CO6: Analyze and design columns using different formulae

Unit-I

Fundamentals: Stress and strain, engineering properties, Saint-Venant's Principle. Stress strain diagrams, mechanical properties of materials, elasticity and plasticity. Shear stress and strain, pure shear, complementary shear. Poison's ratio, volumetric strain, bulk modulus of elasticity. Elastic constants and relation between elastic modulie.

Linear elasticity and Hooke's law. Temperature stresses and effects. Stress and strain in axially loaded members.

Unit-II

Analysis of Stress and Strain: Stress at a point, stress components. Stresses on inclined planes. Plane stress and strain. Mohr's circle representation of plain stress and strain. Principle stresses and strains, maximum shear stresses. Hooke's law for plain stress.

Stresses in thin cylinder and special shells subjected to internal & external pressures.

Unit-III

Beam under Flexural Loads: Bending moment and shear force, relation between load, Shear force and bending moment. Bending moment and shear force diagrams for simply supported, Cantilever and overhang beams under static loading of different types viz. point loads, Uniformly distributed loads, linearly varying loads, Pure bending. Theory of simple bending of initially straight beams. Flexural stresses in beams. Built up and composite beams. Shear stresses in beams of Rectangular, Circular and I-section. Shear formula, effect of shear strain.

Unit-IV

Torsion: Torsion of solid and hollow circular shafts. Non-uniform torsion.

Columns: Buckling and stability, critical load. Euler's theory for initially straight column with different end conditions, equivalent length, Limitation of Eulor's formula. Rankine's formula. Column under eccentric loading. Secant, Perry's and Indian standard Formulae.

Practical

1. Study of Universal Testing Machine, its part and functions.
2. Operation of U.T.M, fixing of specimen for different testing.
3. Tensile test on mild steel specimen to failure and computing, Stresses, % elongation, Contraction etc.
4. Compression test on timber.
5. Compression test on mild steel.
6. Compression test on concrete cube.
7. Determination of toughness test of mild steel, Brass and Aluminum by Charpy test.
8. Determination of toughness by Izod test for wood, Aluminum & Brass.

9. Study of torsion testing machine.
10. Performance of torsion test on circular shaft specimen.
11. Bending test on wooden beam and determination of modulus of rupture.
12. Deflection test on wooden beam.

Text Books / References

1. Junarkar S.B. and Shah H.J., 'Mechanics of Structures' Vol.-I Charoter Publishing, Anand.
2. PunmiaB.C., 'Strength of Materials and Mechanics of Structures', Vol-I, Standard Publisher distributors, New Delhi.
3. Fedinard L., 'Strength of Materials', Singer& Andrew Pytel'.
4. Fenner, 'Mechanics of Solids'.
5. Davis H. E, Trophell, G.E. &Hanck, G.F.W., 'The Testing of Engineering Materials', McGraw Hill.
6. Timoshenko, S.P. & Young, D.H., 'Strength of Materials', East West Press Limited.

CE 234 (ESC) FLUID MECHANICS

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

CO1: Demonstrate the knowledge of fluid properties

CO2: Analyze forces and pressure variations on submerged bodies

CO3: Analyze fluid flow pattern, characteristics and apply the same to solve general flow problems

CO4: Apply energy and momentum equations to determine fluid flow parameters

CO5: Apply the knowledge to solve civil engineering problems relating to fluid flow.

CO6: Understand the fluid dynamics.

Unit-I

Fluids: Definition, Ideal fluids, real fluids. Newtonian and non-newtonian fluids.

Properties of Fluids: Units of measurement, Mass density, Specific weight, Specific volume, Specific Gravity. Surface tension and Capillary. Compressibility and Elasticity.

Hydro-Statics: Pressure at a point in a static fluid (pressure variation in compressible static fluid; atmospheric pressure). Gauge pressure, vacuum pressure, absolute pressure, Manometers, Bourdon pressure gauge.

Unit- II

Forces acting on immersed plane surface. Centre of pressure, forces on curved surfaces.

*Hydro-Kinematics:*Types of Flows: Steady and unsteady, uniform and non-uniform, stream lines, path lines, stream tubes, principles of conservation of mass, equation of continuity, elementary concept of acceleration velocity potential and stream function.

Unit- III

Dynamics of Fluid Flow: Euler's equations of motion in Cartesian co-ordinate and its integration, Bernoulli's equation for incompressible fluids, assumptions in Bernoulli's equation, Energy correction factor.

Dimensional analysis and similitude: Dimensions and units of measurement. Principle ofdimensional homogeneity. Buckinghum's pi theorem. Dimensional analysis of typical flow problems. Geometric, Kinematic and dynamic similarity. Important dimensional-lessnumbers and significance. Planning and operation of undistorted models of typical flowproblems. Merits, demerits and planning of distorted models.

Unit IV

Application of Energy Equation: Application of energy equation for simple problem, pitot tube, orifice meter and venturi meter,

Momentum Equation: Development of momentum equation by control volume concept, Momentum correction factor.Application of momentum equation for simple problem, Force on a pipe bend.

Practical

1. Flow through Orifice (Determination of Hydraulic Co-efficient): Constant Head Method.

2. Flow through Triangular Notch (Calibration).
3. Flow through Rectangular Notch (Calibration).
4. Flow through Venturimeter (Calibration).
5. Flow through Orifice Meter (Calibration).
6. To verify the momentum equation.

Suggested Books & References

1. H.M. Raghunath, 'Fluid Mechanics'.
2. P.N. Modi& S.M. Seth, 'Hydraulics & Fluid Mechanics'.
3. K.R. Arora, 'Fluid mechanics, Huydraulics& Hydraulic Machines'.
4. Garde&Mirajgaokar, 'Fluid Mechanics'.
5. R.K.Bansal, 'Fluid Mechanics & Hydraulic Machines', Laxmi Publication (P) Ltd., New Delhi.

CE 235 (PCC) BUILDING PLANNING AND CONSTRUCTION

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Understand pre-requisite of building planning and Demonstrate the knowledge of building planning.

CO2: Understand functional requirement, orientation and ventilation of building.

CO3: Acquire knowledge of energy efficient building. acoustics& sound insulation.

CO4: Demonstrate the knowledge of different type of foundations and its objectives.

CO5: Demonstrate knowledge of building material like timber, stone etc.

CO6: Draw plan of doors,windows& staircase.

BUILDING PLANNING

Unit -I

Introduction: Type of building**,** criteria for site selection, site plan.

Planning of Building: Planning, regulations and bylaws. Regulation regarding: lines of building frontages, built up area of buildings, open space around buildings and their heights, provision to size, height and ventilation of rooms and apartments and sanitary provisions.

Principal of Planning: Factors affecting planning (aspect, prospect, privacy, grouping, roominess, furniture requirement, sanitation, flexibility, circulation, elegance, economy etc).

Unit-II

Orientation of Buildings: Factors affecting orientation, orientation criteria under Indian condition.Sun diagram and relevant details.

Thermal Insulation of Buildings: Objectives, advantages, general principle and method of thermal insulation.

Energy Efficient Buildings: Concepts of Energy Efficient Buildings.

Acoustic: Definition, velocity, frequency, intensity & reflection of sound, reverberation, absorption of sound, Sabin's equation. Types of absorbent material. Noise & its effect. Types & transmission of noise. Sound insulation of walls & floors.

BUILDING CONSTRUCTION

Unit –III

Structural component of a building

Foundation: Objectives, shallow foundation, grillage, raft, Inver teal arches, pile foundation. Causes of failure of foundation & remedial measures.

Brick Masonry: Types of brick masonry, English and Flemish bond (for 1 and 1 ½ bricks), Essentials of good brick masonry.

Stone Masonry: Materials required for stone masonry, Types of stone masonry (rubble & Ashlar masonry), Essentials of good stone masonry.

Unit –IV

Introduction to Scaffolding, Shoring and Underpinning.

Floors: Various Types (stone patti, timber and R.C.C. floors), details of construction. Floor finishes (Lime, Cement concrete, terrazzo, marble and P.V.C. tiles).

Doors: Paneled, Glazed and Flush door. *Window*s : Casement and Sash window.

Roofs: Simple roof trusses, lean to verandah roof, king post roof truss, queen post roof truss, North light truss.

Staircase: Dog-legged Staircase, Requirement of a good Staircase. Proportioning rules of a Staircase.

Practical: Will be as per theory syllabus.

Suggested Books & References

1 Rangwala, S.C., 'Engineering Materials', Charotar Book Stall, Anand.

2 Arora, S.P. and Bindra, 'Building Construction', DhanpatRai& Sons, New Delhi.

3 Awaasthy, S.N., 'Building Construction', Publishing House, Bhopal

CE 236 (PCC) BUILDING DRAWING

Cr. Hrs. 1 (0+0+1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**2**

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

CO1: Demonstrate knowledge of blue print reading

CO2: Draw detailed drawings for various building components.

CO3: Plan elevation and section of building.

CO4: Plan and drawing of dispensary.

CO5: Plan and drawing of workshop structure (Truss roof)

CO6: Planning, designing and detailed drawings of staircase.

Blue print reading.

Detailed drawings for doors, windows, rolling shutters and collapsible gates.

Detailed Drawings (Plan, Elevation and section for the following);

Simple residential buildings, office & institutional building with flat roof.

Dispensary – Provision for Handicapped people.

Workshop – Trussed roof.

Planning, design and detailed drawings of staircase.

Suggested Books & References

1. Singh, Gurucharan, 'Building Drawing'.
2. Shah, M. G., 'Building Drawing'.

CE 237 (PCC) COMPUTER AIDED DRAWING

Cr. Hrs. 1 (0+0+1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**2**

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

CO1: Understand AutoCAD software.

CO2: Do 2D Drafting

CO3: Draw drawing entities.

CO4: Print for a drawing work with dimensioning.

CO5: Make drawings of different structures.

Introduction to Computer Aided Drafting using popular software like AutoCad. Drawing entities. Drawing, modifying, viewing, printing and dimensioning commands. Drawing aids, coordinates systems, layers, hatching, etc. Blocks. Simple 2-D drawing and dimensioning exercises. Ploting of a drawing.

Suggested Books & References

1. AutoCad Reference Manual.
2. George Omura, 'Mastering AutoCad'.

CE238 (PCC) Concrete Technology

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Acquire knowledge of composition & characteristics of cement, aggregates and concrete.

CO2: Understand various types of admixture used in concrete.

CO3: Design concrete mix as per IS 10262: 2019

CO4: Understand concrete handling production methodology as per field conditions.

CO5: Understand properties of concrete and special types of concrete and get knowledge of form work.

CO6: Analyze and determine various concrete properties with the aid of experimental studies

Unit-I

Cement: Constituents of cement and their role, composition of cement (Bogue's equation) hydration of cement, structure of hydrated cement, heat of hydration. Tests of cement as per IS code.

Aggregates: Classification, properties and grading of aggregates. Tests on aggregates as per IS code.

Admixture in Concrete: Chemical and mineral admixtures (their types and use under different conditions). Use of fly ash and silica fume in concrete.

Unit-II

*Concrete:*Grade of concrete, water content and its quality for concrete, water/cement ratio and its role.

Concrete Mix Design: Nominal and design mixes, Controlling factors for proportioning of ingredients and Design of concrete mix by IS method.

Fresh Concrete: workability, flowability, factors affecting and methods to determine these properties. Standard tests on fresh concrete as per IS code.

Unit-III

Hardened Concrete: Strength, permeability, creep and shrinkage, factors influencing these properties. Standard tests on hardened concrete as per IS code. .Acceptance Criteria.

*Concrete Handling in Field:*Introduction to mixing & batching methods, placing, transportation, compaction and curing methods, Ready mix concrete.

Unit-IV

Form Work: Requirements, type & method to provide centering and shuttering for beams, slabs, and walls, slip and moving formwork.

*Special Concretes:*Introduction to: High strength Concrete, High performance Concrete, Light weight concrete, Fibre reinforced concrete, Polymer concrete composites, Self-Compacting Concrete.

Practical

1. To determine the percentage of water required to prepare a cement paste of standard consistency.
2. To determine the Initial Setting Time for a cement sample.
3. To determine the specific gravity and void ratio for a cement sample.
4. To determine the compressive strength for a cement sample.
5. To determine the specific gravity and void ratio for a sample of (i) Fine aggregate (ii) Coarse aggregate.
6. To determine the bulking of sand for varying water content.
7. To determine the Fine modulus and Grading for a sample of (i) Fine aggregate (ii) Coarse aggregate.
8. To determine characteristics compressive strength of concrete with varying water cement ratio.
9. To determine Slump and Compaction factor of concrete.

10. To determine the modulus of rupture of concrete and relation with its compressive strength.

11. To determine the effect of compaction and curing on compressive strength of concrete.

12. To determine the effect of quantity of fine aggregate on compressive strength of concrete.

13. To design a concrete mix using I.S. method.

Suggested Books & References

1. Shetty M.S. "Concrete Technology"

2. Mehta PK & Monteriro P.J.M., "Concrete Microstructure, Properties and Materials".

3. Neville A M. & Brooks J.J. "Concrete Technology".

SECOND YEAR B.TECH. (IV SEMESTER)

BS241 (BSC) MATHEMATICS-IV

Cr. Hrs. 3 (2 + 1 + 0)

	L	T	P
Credit	**2**	**1**	**0**
Hours	**2**	**1**	**0**

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

CO1: Demonstrate proficiency in solving Fourier Series.

CO2: Solve Algebraic and Transcendental Equation.

CO3: Solve Wave equation and Laplace's equations.

CO4: Show competence in Statistics, Correlation and regression.

Unit-I

Fourier Series: Fourier series, even and odd functions; Half range series; Change of interval; Exponential form of Fourier series; Harmonic analysis.

Unit-II

Roots of Nonlinear (Algebraic and Transcendental) Equations: Bisection method, False position method, Newton Raphson method; Convergence of False position and Newton Raphson method. Complex roots of polynomials by Bairstow's method.

Unit-III

Partial Differential Equations: Classifications of partial differential equations; Method of separation of variables to solve Heat equation, Wave equation and Laplace's equations.

Unit-IV

Statistics: Correlation and regression; Principle of least square method and curve fitting.

Probability Distribution Functions: Random variable; Mathematical expectations; Moment generating functions; Discrete and continuous distribution functions; Binomial, Poisson and Normal distributions.

Text Book/ Reference

1. J.L. Bansal and H.S. Dhami, *Differential Equations (Vols.-II)*, Jaipur Publishing House, Jaipur (2005).
2. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics (VII Edition), Laxmi Publication Pvt. Ltd., New Delhi.
3. S.C. Gupta and V.K. Kapoor, Mathematical Statistics, Sultan Chand & Sons, New Delhi.

CS 242 (ESC)
PRINCIPLES OF OBJECT ORIENTED PROGRAMMING

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Prepare of flow chart by computer algorithms

CO2: Understand the basic concepts of C++ language

CO3: Understand the program structure and use various functions in programming

CO4: Work with class and derived classes

CO5: Write programs in C++ language

CO6: Apply knowledge of C++ language for civil engineering problems.

Unit-I

Algorithms and flow charts: Computer Algorithms for problem solution and flow charts.

OOP Fundamentals: Concept of class and object, attributes, public private and protected members, derived classes, single & multiple inheritance.

*Programming in C++:*Enhancements in C++ over C in data types operators and functions.

Unit-II

Program structure, Functions. cin, cout, iomanip.h, for, while, do-while loops. If, if-else, nested if-else, switch, logical and, or and not operators, break, continue, goto and exit statement, functions, declarations, definations, returns. Parameters by values, by reference, default arguments.

Unit-III

Inline functions, Automatic, external, static, variables. Constructors and distracters. Objects and Memory allocations, const and classes, Objects as arguments to functions. Arrays and strings. Friend function, function and operator overloading.

Unit-IV

Working with class and derived classes, Single, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects, Input-output flags and formatting operations.

Practical: As per theory syllabus.

Text Books/ References

1. C Gottfried, ' Programming in C', Schaum Series
2. E. Balaguruswamy, 'Programming in C'.
3. Balaguruswamy, 'Object Oriented Programming in C++'.

CE 243 (ESC) DISASTER MITIGATION & MANAGEMENT

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understanding the nature of disasters and its vulnerability.

CO2: Preparedness for natural disasters.

CO3: Response and recovery during and after occurrence of disasters.

CO4: Understanding fire hazard in buildings.

CO5: Case studies and capacity building.

Unit- I

Definition of Disasters/Hazards, Types of Disasters: Natural and Manmade Disasters.

Earthquakes: Earthquake terminology, Earthquake Magnitude & Intensity and their

measuring scales, Occurrence of earthquakes: Plate tectonic theory.

Effect of earthquake on structures: Planning/architectural concepts, Earthquake resistant practices/features.

Unit- II

Drought Management: Understanding Drought, Drought Monitoring and Early warning,

Drought Declaration, Drought Response and Relief, Drought Mitigation.

Fire Protection in Building: General, causes & effect of fire. Characteristics of fire resisting

material. Fire resisting properties of common building material. General rules for fire resisting buildings. Concept of strong room construction.

Unit- III

Introduction to Landslide, Tsunami, Flood, Sand Storms and Cyclone disasters:

Mitigation, Prevention, Preparedness, Response, Rehabilitation and Recovery of these disasters.

Unit- IV

Introduction to Nuclear and Chemical disasters: Vulnerability of Indian continent to different types of Nuclear and Chemical disasters.

Various Case studies: Case study of Bhuj Earthquake (2001), Case of study Bhopal Gas.

Tragedy (1984), Case study of Tsunami in Indian Continent (2006), Case study of Japan Nuclear Tragedy (2011).

Disaster and Nodal Ministry: Functioning of NDRF, Rajasthan state response mechanism,

Disaster Management Executive committee, District level response mechanism.

Assignments/Practicals: As per theory syllabus.

Suggested Books & References

1. G.K. Ghosh, “Disaster Management”, A.P.H. Publishing Corporation.
2. R.S. Shekhawat, “Disaster Management”, Himanshu Publication
3. B Narayan , “Disaster Management”, A.P.H. Publishing Corporation.
4. NikujKumar , “Disaster Management”, Alfa Publications.
5. Day R.W. (2002). Geotechnical Earthquake Engineering Handbook, McGraw-Hill Handbooks, New york.

CE244 (PCC) STRUCTURAL ANALYSIS

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Calculate deflection of Beams at various load condition.

CO2: Analysis of Fixed beam, continuous beam & propped cantilever beam.

CO3: Calculate strain energy & deflection of frames

CO4: Acquire knowledge of different types of springs and its properties.

CO5: Understand type of failure in structure.

CO6: Analysis of determinate space frames

Unit-I

Deflection of Beams: Differential relation between load, shear force, bending moment, slope and deflection. Slope & deflection in determinate beams using double integration method, Macaulay's method, area moment method and conjugate beam method.

Unit-II

Propped Cantilever Beam: Analysis of propped cantilever beam.

Fixed Beams & Continuous Beams: Analysis of fixed beams & continuous beams by three moment theorem.

Unit-III

Introduction to Energy Methods: Strain energy due to bending, shear and torsion. Castigleno's first theorem, Unit load method and deflection of determinate beams & frames.

Reciprocal Theorem: Maxwell's reciprocal theorem. Betti's theorem.

Springs: Stiffness of springs, close coiled helical springs, springs in series and parallel. Laminated plate springs.

Unit-IV

Theories of Failures: Concepts of maximum principal stress theory, maximum principal strain theory, maximum shear stress theory, maximum strain energy theory and maximum shear strain energy theory.

Space Frames: Analysis of determinate space frames by tension coefficient method.

Practical

1. Bending test on wooden beam and determination of modulus of rupture.
2. Deflection test on wooden beam.
3. Stiffness of open coiled helical spring.
4. Stiffness of close coiled helical spring.
5. Deflection test on laminated plate spring.
6. Determination of the reaction of beam by graphical method.
7. Analysis of a truss by graphical method.
8. Other practical exercises based on course syllabus.
9. Numerical problems based on theory syllabus.

Suggested Books & References

1. Fedinard L. Singer & Andrew Pytel, “Strength of Materials”.
2. Fenner, “Mechanics of Solids”.
3. PunmiaB.C. “Strength of Material & Mechanics of Structures”.
4. Junarkar,“Mechanics of structures vol. I & II”.

CE 245 (PCC) HYDRAULICS & HYDRAULIC MACHINES

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand flow in pipes

CO2: Understand flow through open channels. Design economical channel section.

CO3: Acquire knowledge of laminar and turbulent flow in channel flow.

CO4: Understand the Impact of free jet.

CO5: Acquire knowledge about hydraulic machines like pumps and turbines.

Unit-I

Flow in Pipes: Laminar flow, Reynolds experiment, transition from laminar to turbulent flow. Turbulent Flow (Laws of fluid friction factor, loss of head due to friction and other causes). Hydraulic gradient total energy line, Chezy's and Mannings's formula. Flow through parallel pipes and pipes in series.

Unit- II

Flow Through Open Channels: Steady and uniform flow in open channel, Discharge formulae of Chezy, Manning and Bazin. Most economic section for rectangular, trapezoidal and circular channels. Non-Uniform Flow in open channel. Specific energy of flow. Alternate depths. Critical depth in prismatic channels. Rapid, critical and sub critical flow. Mild, steep and critical slopes. Classification of surface curves in prismatic channels and elementary computation.

Unit- III

Hydraulic jump: Hydraulic jump in rectangular channels, conjugate or sequent depths

Laminar Flow: Relation between shear & pressure gradient. Flow between plates & pipes.

*Turbulent Flow in Pipes:*Theories of Turbulence, Nikuradse's Experiments Hydro-dynamically smooth & rough boundaries, Laminar sub layer.

Introduction to boundary layer theory, Development of boundary layer over a thin flat plate, Laminar and Turbulent Boundary Layer.

Unit-IV

Impact of Free Jets: Impact of a jet on a flat or a curved vane, moving and stationary vane.

Centrifugal Pumps and Reciprocating pumps: Elementary concept of single and multistage pumps, Efficiencies, Specific speed, characteristic curves.

Turbines: Reaction and Impulse turbines, specific speed, Mixed flow turbines, Elementary concept of Pelton wheel turbine, Francis turbine.

Practical

1. To determine the minor losses.
2. Flow through Pipes (Determination of co-efficient of friction).
3. To Reynolds apparatus (Determination of Reynolds Number).
4. To determine Manning’s roughness co-efficient
5. To Determine Chezy's coefficient of roughness for the bed of a given flume.

6. To plot characteristics curve of Pelton Wheel.
7. To plot characteristics curve of Centrifugal Pump.

Suggested Books & References

1. Modi & Seth, 'Hydraulics and Hydraulic Machines.
2. Dr. K.R. Arora, 'Fluid Mechanics, Hydraulics and Hydraulic Machines.
3. H.M. Raghunath, 'Fluid Mechanics.
4. Dr. R. K. Bansal, 'Fluid Mechanics & Hydraulic Machines', Laxmi Publication (P) Ltd., New Delhi

CE 246 (PCC) GEOTECHNICAL ENGINEERING-I

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Fundamental knowledge of soil and soil mass.

CO2: Basic introduction and determination of index properties of soil.

CO3: Classification of soil. Study of Flow through Soils and Seepage.

CO4: Able to find out various stresses in soil mass.

CO5: Introduce soil compaction and soil stabilization by various methods.

CO6: Conduct experimental studies to determine soil properties.

Unit- I

Fundamental Definitions & Relationship: Soil and soil mass constituents, Water content, specific gravity, void ratio, porosity, degree of saturation, air void and air content, unit weights, density index. Interrelationship of these terms.

Index Properties: Determination of index properties of soil, water content, specific gravity, particle size distribution, sieve and sedimentation analysis, consistency limits, void ratio and density index.

Unit- II

Soil Classification: Classification of soil for general engineering purposes, particle size, textural H.R.B. Unified and I.S. Classification systems.

Flow through Soils: Soil water absorbed capillary and free water, Darcy's law of permeability of soil and its determination in laboratory: Field pumping out tests, factors affecting permeability, permeability of stratified soil masses.

Seepage: Seepage pressure, Laplace's equation for seepage. Flownet and its construction. Uplift pressure, piping, principle of drainage by Electro Osmosis, pheritic line.

Unit- III

Stresses in Soil Mass: Total effective and neutral pressure, calculation of stresses. Influence of water table on effective stress, quicksand phenomenon.

Shear Strength of Soils: Mohr's circle of stress, shearing strength of soil, parameters of shear strength, Coulomb's failure envelope, determination of shear parameters by Direct Shear Box. Triaxial and unconfined compression test apparatuses.

Unit- IV

Soil Compaction: Principles of soil compaction, laboratory compaction tests, Proctor's test, Modified Proctor tests, Measurement of field compaction, field methods of compaction and its control, dry and wet of optimum. Factors affecting compaction.

*Soil Stabilization:*Soil stabilization, Mechanical Stabilization, Stabilization with cement, Lime and bitumen.

Practical

1. Determination of Moisture Content of a given sample of soil.
2. Determination of Specific Gravity & Relative Density for a given sample of soil.
3. Field Density Test on a given sample of soil.
4. Determination of Sieve Analysis for a given sample of Coarse Grained soil.
5. Determination of Consistency Limits and Indices for a given sample of soil.
6. Standard Proctor’s Compaction Test on a given sample of soil.

7. Permeability Test on a given sample of soil.
8. Unconfined Compression Test for a given sample of Cohesive Soil.
9. Determination of Vane Shear Strength for a given sample of Cohesive Soil.
10. Direct Shear Test on for a given sample Sand.
11. Triaxial Compression Test on a given sample soil.

Suggested Books & References

1. Punmia, B.C., 'Soil Mechanics and Foundations'.
2. Ranjan G. & Rao, 'Basic and Applied Soil Mechanics'.
3. Singh Alam, 'Soil Engineering in Theory and Practice'.
4. Arora, K.R., 'Soil Mechanics & Foundation Engineering'.
5. Gulhati, Shashi K &DattaManoj, 'Geotechnical Engineering Principles and Practices', Pearson Education Ltd.
6. Prasad, 'Soil Dynamics & Earth Quake Engineering', Prentice-Hall of India.
7. Varghese, 'Foundation Engineering', Prentice –Hall of India.
8. Coduto, Donald P., 'Geotechnical Engineering Principles and Practices', Pearson Education Ltd.

CE 247 (PCC) SURVEYING-I

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Measurement of distance by laser based instruments.

CO2: Conduct compass survey.

CO3: Demonstrate the knowledge of different conventional and modern survey tools.

CO4: Conduct traversing survey, contour mapping & calculate area & volume.

CO5: Conduct detailed theodolite Surveying.

CO6: Draw contour and find area and volume using contour.

Unit-I

Measurement of distances using laser based techniques, *Measurement of Angle & Direction:* Reference meridians, bearing and azimuths, magnetic declination and its variation.

Traversing: Chain**,** compass traversing, open traverse, close traverse, closing error and magnitude of closing error. Graphical adjustment of close traverse.

Leveling: Definitions of various terms in leveling. Types of leveling, sources of errors in leveling. Curvature and refraction corrections. Temporary and permanent adjustment of dumpy & tilting levels. Computation of levels. Profile leveling (L-Section and cross-sections). Special method of spirit leveling, differential leveling.

Unit-II

Area Calculation: Area of regular boundaries by mathematical formulae, use of trapezoidal & Simpsons formula, their limitations. Planimeter (construction, use & area calculations), use of zero circle & solution of numerical problems. Area measurement through digital planimeter.

Computation of Volumes: Volume of reservoir from contour map Volume from spot levels & contour plans. Earthwork calculations, Level, two level & side hill two level section.

Unit-III

Theodolite surveying : Details of transit theodolite, definition & terms, temporary adjustment of and permanent adjustment of vernier theodolite. Measurement of horizontal and vertical angle. Application of theodolite in field problems. Sources of error in the thedolite work & procedure to eliminate/minimize the errors.

Unit-IV

Contour & Contouring: Definition of contour, contour internal, choice of contour internal, characteristics of contour. Method of locating contours by square method, cross sections &tacheometric method. Interpolation of contours. Use of contour maps.

Practicals

1. Introduction of prismatic and surveyor compass.
2. Find out interior angle of the given four side traverse.
3. Find out interior angle of the given five side traverse.
4. Adjustment of closing error by graphical method.
5. Study of various levels and their temporary adjustments.
6. Permanent adjustment of dumpy level.
7. Reduced level calculations obtained from dumpy level.
8. Study of theodolite and its temporary adjustment.
9. Measurement of horizontal angle with the help of repetition method.
10. Measurement of horizontal angle with the help of reiteration method.
11. Measurement of vertical angle with the help of theodolite.
12. Contouring by grid method.
13. Contouring by radial line method.
14. Contouring by spot level method.
15. Practice of contour plotting by various methods.
16. Use of planimeter and determine its constants. Calculation of areas of irregular boundaries

Suggested Books & References

1. Arora K. R., 'Surveying', Vol. I & II.
2. Punmia B.C., 'Surveying' Vol. I & II.
3. Clendinning and Oliver, 'Principles and use of surveying instruments'.
4. Kanetkar T. P., 'Surveying and leveling', Vol. I & II.
5. Duggal S. K., 'Text book-Surveying', Vol. I & II.

CE 248 (PCC) TRANSPORTATION ENGINEERING-I

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Understand the role of transportation system and highway planning.

CO2: Calculate geometrical design parameters of highway.

CO3: Analyze different traffic studies.

CO4: Construct different type of highway roads.

CO5: Demonstrate knowledge of Highway material and their properties.

CO6: Design highway & pavements.

CO7: Knowledge about Highway Maintenance and Highway Drainage.

Unit-I

Introduction: Importance and Role of Transportation Systems. Transportation Modes and their comparison.

Highway Planning : Highway planning Process (specifically of India), Preparation of master plan, Classification of Roads, Road Patterns, Highway Alignment (Controlling Factors and Surveys), Introduction to hill roads & rural roads.

Unit- II

Highway Geometric Design: Cross Sectional Elements, camber, Sight Distances, definition and analysis of SSD and OSD, Design of Horizontal Alignment (Super elevation, extra widening, transition curves), Vertical Alignment (Gradients and types of vertical curves).

Unit-III

Elementary Traffic Engineering: Significance of different Traffic Engineering Studies (Speed, Volume, O & D, Parking and Accident's Study), Importance and type of Traffic Signs, Signals, Road Marking and Road Intersections.

Highway Materials: Desirable Properties, Testing Procedures and Standard values relating to Stone Aggregates, Bitumen and Tar.

Construction: Methods of constructing different types of roads (Stabilized roads, WBM roads, bituminous roads and Concrete roads).

Unit-IV

Structural Design of Pavements: Factors affecting design of flexible and rigid Pavements, Concept of equivalent single wheel load, Design of Flexible Pavements by CBR method (as per guidelines of IRC).

Highway Maintenance: Brief introduction of failure pattern and maintenance for WBM, Bitumen and Concrete Roads.

Highway Drainage: Introduction to various types of C.D. works.

Practical

1. To determine the elongation and flakiness index for an aggregate sample.
2. To determine the Crushing value for an aggregate sample.
3. To determine the Impact value for an aggregate sample.
4. To determine the Abrasion value for an aggregate sample.
5. To determine the Softening point for a bitumen sample.
6. To determine the Penetration value for a bitumen sample.
7. To determine the Ductility value for a bitumen sample.
8. Introduction to design a bitumen mix using Marshall Method.
9.

Suggested Books & References

1. Khanna and Justo, 'Highway Engineering'.
2. L.R. Kadiyali, 'Highway Engineering'.
3. G.R.Rao , 'Traffic Engineering and Transportation Planning'.

   Chakrobrati and Das, ‘Principles of Transportation Engineering’.

THIRD YEAR B.TECH. (V SEMESTER)

CE351 (PCC)THEORY OF STRUCTURES-I

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Analyze static and kinematic indeterminacy of beam and frames.

CO2: Analyze continuous beams and portal frames by slope deflection method.

CO3: Analyze continuous beams and portal frames (with and without sway) by moment distribution method.

CO4: Analyze trussed beam & portal frame by energy method.

CO5: Analyze multi storey frames.

CO6: Apply the knowledge of different analysis methods to solve structural problems.

Unit-I

Static and Kinematic Indeterminacy: Static and kinematic indeterminacy (beam, frames: with & without sway), Introduction of Indeterminate structures.

Slope Deflection Method: Analysis of continuous beams and portal frames (without inclined members).

Unit-II

Moment Distribution Method: Analysis of continuous beams and portal frames (with and without sway).

Unit-III

Energy Methods: Castigliano's second theorem. Principle of minimum strain energy. Application to frames with one and two redundant members. Trussed beam, portal frames.

Unit-IV

Approximate Analysis: Analysis of multi storey frames by approximate methods: Portal and Cantilever method.

Practical

1 Analysis of a portal frame by slope deflection method.

2 Analysis of a portal frame by moment distribution method.

3 Application of Catigliano's II theorem to frames with one redundant member.

4 Analysis of multistory frames by portal method.

5 Analysis of multistory frames by cantilever method.

6 Introduction to matrix method of structure analysis.

7 Analysis of multistory frames by stiffness method.

Suggested Books & References

1. Junarkar, 'Mechanics of Structures', Vol II.
2. Punmia, B.C., 'Strength of materials and theory of structures', Vol –II.
3. Vazirani & Ratwani, 'Analysis of Structures', Vol. II

CE 352 (PCC) DESIGN OF CONCRETE STRUCTURES-I

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Understand various design philosophies.

CO2: Analyze and design of beams in flexure, shear, torsion and bond stress using limit state design method.

CO3: Analyze and design of structural members for serviceability condition.

CO4: Analyze and design of slabs.

CO5: Analyze and design for columns and footings.

CO6: Analyze and design of staircase and retaining wall.

Unit-I

Design Philosophies: Introduction to Working stress, ultimate load and limit state methods.

Analysis and Design of Flexural Members(Using limit state design method):

*Rectangular sections:*Singly and doubly reinforced.

*T section:*Singly reinforced.

Unit-II

*Shear and Bond:*Behaviour of beams in shear and bond, design for shear, anchorage curtailment and splicing of reinforcement, detailing of reinforcement.

*Torsion:*I.S. code provisions for torsion in beams.

*Serviceability Conditions:*I.S. code provisions for limit states of deflection and cracking.

*Slabs, Lintels:*Design of one way and two way slabs, design of lintels and introduction of flat slab.

Unit-III

Design of Columns: Short and long columns, eccentrically loaded columns (uni-axial).

Column Footings: Isolated column footing and combined footing for two columns (without central beam).

Unit-IV

*Staircases:*Design of dog-legged staircases.

Cantilever Retaining Walls: Design of cantilever type retaining walls & introduction to counter-fort retaining wall.

Note: The use of IS 456:2000, SP16 shall be allowed in the examination.

Practical

1. Design of Flexural Members
2. Design of Lintels

3. Design of slabs (one way and two way).
4. Design of columns and its footings.
5. Design of dog-legged staircase.
6. Design of cantilever type retaining walls.
7. Site visits for structural arrangement of members.

Note

- To the scale sketching would be done in the sketch book by hand and then the drawings would be drafted using Drafting Package/ Auto Cad.
- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- Emphasis would be given on structural detailing of various members as per relevant codal provisions.
- Report of a site visit shall be prepared mentioning structural arrangement of members.

Suggested Text Books & References

1. Jain A.K., 'Reinforced Concrete-Limit State Design', Nem Chand & Bros. Roorkee.
2. Krishna J. and Jain O.P., 'Plain and Reinforced Concrete, Vol. I. New Chand & Bros. Roorkee.
3. Dayaratnam P., 'Reinforced Concrete Structures', Oxford and IBH Publishing Co.
4. Punamia B.C., 'Limit State Design of Reinforced Concrete', Laxmi Publication Pvt. Ltd.
5. Pillai and Menon, 'Reinforced Concrete Design ', Tata McGraw Hill, New Delhi.
6. 'Design Aids for Reinforced Concrete-to I.S.-456: SP-16', Bureau of Indian Standards, New Delhi.
7. Relevant IS Codes.

CE 353 (PCC) GEOTECHNICAL ENGINEERING-II

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Calculate stresses in soil under various types of loading.

CO2: Find compressibility & consolidation characteristics.

CO3: Check slope strability of embankment & calculate amount of Earth pressure.

CO4: Calculate safe bearing capacity.

CO5: Calculate the earth pressure and Use it for stability analysis.

CO6: Carry out Soil investigation, geophysical investigation for foundation.

Unit-I

Stress in Soil under Surface Loading: Bossinesq's and Westergaard's analysis for vertical pressure and its distribution in a soil mass. Vertical stresses, horizontal and shear stresses (due to concentrated loads). Isobar diagram, Vertical stress distribution on a horizontal plane. Influence diagram. Vertical stresses at point under line load and strip load. Vertical stresses at a point under circular and rectangular loaded area, New Marks' chart. Pressure bulb and its significance in Foundation exploration. Stresses in soil below foundations.

Unit-II

*Compressibility and Consolidation:*One-dimensional consolidation of soil, Degree of consolidation, consolidation test. Terzaghis one-dimensional consolidation theory, Compressibitliy parameters, co-efficient of consolidation. Preconsolidation pressure and its determination. Normally, over and under consolidated soils. Methods of predicting settlement & its rate. Total and differential Settlement.

Stability of Slopes: Classification of slopes, Stability analysis of infinite slopes. Stability of finite slopes by Swedish and Friction circle method. Taylor's stability number curves.

Unit-III

Earth Pressure: Active, passive and earth pressure at rest Rankine's and Coulomb's theories Rebhann's and Culman's graphical method for active earth pressure (vertical and inclined back retaining walls), horizontal and inclined cohessionless back fill. Stability analysis of retaining walls.

Bearing Capacity of Soils: Terminology related to bearing capcaity. Common types of foundations. Terzaghi and Meyehoffs theory for bearing capacity. Rankine's method for minimum depth to foundation Skempton's method. Effect of water table on bearing capacity. IS code method to determine bearing capacity. Plate load and penetration tests.

Unit-IV

Site Investigations: Planning of Investigations. Methods of explorations, depth of exploration. Undisturbed and disturbed samples. Types of Samples. Brief description of procedures of sampling, Transportation and storage of samples, Depth, number &extent of boreholes Geophysical methods of investigations.

Foundations: Introduction to pile, well and machine foundations.

Practical : Will be as per theory syllabus.

Suggested Books & References

1. Punmia, B.C., 'Soil Mechanics and Foundations'.
2. Ranjan G. & Rao, 'Basic and Applied Soil Mechanics'.
3. Singh Alam, 'Soil Engineering in Theory and Practice'.
4. Arora, K.R., 'Soil Mechanics & Foundation Engineering'.
5. Varghese, ‘Foundation Engineering’, Prentice’ –Hall of India.

CE 354 (PCC) DESIGN OF STEEL STRUCTURES-I

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Understand various grade of structural steel and able to design joints in riveted, bolted & welded connection.

CO2: Design of axially loaded member in tension and compression.

CO3: Design of rectangular & I sections for continuous beam.

CO4: Design of structural steel beams and girders.

CO5: Understand the fundamentals of Plastic design.

CO6: Design of Built-up sections and industrial sheds.

Unit-I

*Introduction***:** Types of steels as a structural material, various grades of structural steel, properties and their permissible stresses. Various rolled steel sections and their properties. Introduction to various codes related to steel design of structures (IS 800, 875 etc.)

Structural Fasteners: Riveted, bolted and welded connections. Strength, efficiency and design of joints. Introduction to high strength friction grip bolts.

Unit-III

Plastic Design**:** Fundamentals of plastic theory for steel structures, shape factor, plastic analysis of Continuous beam and portal frames.

Design of Axially Loaded Members: Tension and compression members.

Unit-II

Design axially loaded and eccentrically loaded columns.

Design of lacings and battens for built-up columns.

Column Bases: Slab base, Gusseted base.

Unit-IV

Design of Simple and Built-up Beams: Laterally restrained and unrestrained (symmetrical section only). Curtailment of flange plates.

Gantry Girder: Design of gantry girder.

Note: The use of IS 800, IS: 875, Structural Handbook No.1 shall be allowed in the examination.

Design Assignments shall consist of the following

1 Design of built-up columns

2 Design of beams

3 Design of gantry girder.

4 Design of industrial shed.

- To the scale sketching would be done in the sketch book by hand and then the drawings would be drafted using Drafting Package/ Auto Cad. Six half imperial size drawing sheets would be drawn using drafting software/ Auto CAD
- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- Emphasis would be given on structural detailing of various connections in structural steel work.
- Report of a site visit shall be prepared mentioning structural details with relevant sketches of structural connections.

One site visits would be carried out as a part of practical work. Practical Examination would include a sketching session.

Suggested Books & References

1. Arya & Ajmani, 'Design of Steel Structures'.
2. Duggal S.K. 'Design of Steel Structures'.
3. Punmia B.C., 'Design of Steel Structures'.
4. N. Subramanian., 'Design of steel Structures'.
5. S.S. Bhavikatti, 'Design of Steel Structures'.
6. Steel Hand Book
7. Relevant IS Codes.

CE 355 (PCC) SURVEYING – II

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Conduct tachometric survey and draw plan of land piece by techeometric survey

CO2: Set on ground various curves by using theodolite

CO3: Conduct trigonometry leveling.

CO4: Understand the fundamentals of Arial photography and Field astronomy.

CO5: Use digital instruments such as Total Station & DGPS for survey operations.

Unit –I

Tacheometry: Principle of tacheometric survey & its field application, Stadia method, constants of tacheometer, distance & elevation formulae for staff held vertical & normal. Use of anallactic lens.

Unit–II

*Circular Curves :*Necessity of curves, classification of curves (Simple, compound, reverse & vertical curves), Elements of simple circular curve(definition & notation, designation of curve), setting out of simple circular curve by ordination from the long chord by successive bisection of arc, by offsets from the tangents & by two theodolite method.

*Transition Curve:*General requirement of super elevation, ideal transition curve. Length of transition curve. Methods of setting out a transition curve.

Unit–II

Introduction of laser based technique instruments. Total Station. Distance measurement, horizontal and vertical angle by total station. Introduction of global navigation satellite system (GNSS). Differential global positioning systems (DGPS). Plotting of contour of an area by Total Station.

Unit -IV

Trigonometrical Leveling: Determination of differences of elevations: base of the object accessible, base of the object inaccessible axis at the same level & at different level.

Ariel Photography: Introduction to Ariel Photography.

Field Astronomy: Definitions and basic concepts of Field Astronomy.

Practicals

1. Find out distance by tacheometry.
2. Use of tacheometry with inclined sight and staff held vertical.
3. Use of tacheometry with inclined sight and staff held inclined.
4. Problems of height and distance when base of object is accessible.
5. Problems of height and distance when base of object is inaccessible.
6. Elements of simple circular curve & their calculation
7. Setting of simple circular curve by linear measurement techniques.
8. Introduction of Total Station
9. Distance measured by Total station.
10. Measurement of horizontal angle by Total station.
11. Measurement of vertical angle by Total station.
12. Introduction of DGPS.
13. Reduced level by DGPS.
14. Revision.

Suggested Books & References

1. Arora K.R. ‘Surveying’, Volume I & II.
2. Punmia B.C. ‘Surveying’, Vol. I & II.
3. Clendinning and Oliver, ‘Principles and use of surveying instruments’.
4. Kanetkar T.P., ‘Surveying and leveling’ Vol. I & II.
5. Duggal S.K., ‘Surveying’, Vol. I & II.

CE 356 (PCC)
COMPUTER APPLICATIONS IN CIVIL ENGINEERING

Cr. Hrs. 1 (0+0+1)

	L	T	P
Credit	**0**	**0**	**1**
Hours	**0**	**0**	**2**

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

CO1: Analyze various structural elements using Excel.

CO2: Apply knowledge of structural analysis and design to software such as Staad Pro.

CO3: Understand application of Quantum survey.

CO4: Understand application of geo-referencing

Simple Program development for analysis/Design of Beam, column, Slab and foundation using Excel.

Introduction to STAAD.Pro/ Equivalent Software. Analysis and Design of Concrete and Steel Structure using STAAD.pro or Equivalent Software.

Application of Quantum GIS in surveying.

Application of Primavera for estimation and Costing.

Introduction to MATLAB.

Suggested Books & References

1. User Manual of Excel.
2. User Manual of STAAD.Pro / Equivalent Software
3. User Manual of Quantum GIS.
4. User Manual of Primavera
5. User Manual of MATLAB

THIRD YEAR B.TECH. (VI SEMESTER)

CE 361 (PCC) DESIGN OF CONCRETE STRUCTURES-II

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Design continuous beam, rectangular portal frame as per I.S. code.

CO2: Understand concept of yield line theory for slabs.

CO3: Design beam in curved in plan.

CO4: Design of domes.

CO5: Design of water tanks as per I.S. 3370, including staging.

CO6: Understand concept of pre-stressed concrete and design of pre-stressed concrete structure.

Unit- I

Continuous Beams: Design of continuous R.C. beams (using I.S. code coefficients).

Portal Frame: Design of rectangular portal frame (one storey and one bay) with fixed end at base.

*Yield Line Theory:*Concept of yield line theory,Design of rectangular slab with U.D.L. & simple support conditions.

Unit-II

Beams Curved in Plan: Analysis of ring beams uniformly loaded & supported on equi-spaced columns.

Domes: Design of circular domes with UDL, concentrated load at crown.

Unit-III

Water Tanks(Using working stress design method):Design of circular tanks (as per I.S. 3370), Design of Intze type tanks (membrane analysis only), Design of staging (braced type column).

*Elements of Prestress Concrete:*Principles, pre-tensioning and post tensioning systems, Material properties, Losses of prestress.

Unit-IV

Analysis of pre-stressed sections (Stress/load balancing/strength concepts), Design of a simple supported beams of rectangular section for flexure using limit state design (excluding end block).

Note: The use of IS 456:2000, SP16, 'Reinforced Concrete Design Hand Book by Reynolds &Steedman, IS 1343, IS 3370 (Part 1 to 3) shall be allowed in the examination.

Practical

1 Design of Continuous beams.

2 Design of Portal frame.

3 Design of rectangular slab with U.D.L using yield line method.

4 Design of water Tanks.

5 Design of a prestressed rectangular beam (simple supported) for flexure.

6 Site visits for structural arrangement of members.

Note

- To the scale sketching would be done in the sketch book by hand and then the drawings would be drafted using Drafting Package/ Auto Cad.
- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- Emphasis would be given on structural detailing of various members as per relevant codal provisions.
- Report of a site visit shall be prepared mentioning structural arrangement of members.

Suggested Text Books & References

1. Jain A.K., 'Reinforced Concrete-Limit State Design', Nem Chand & Bros. Roorkee.

2. Krishna J. and Jain O.P., 'Plain and Reinforced Concrete, Vol. II. New Chand & Bros. Roorkee.

3. Dayaratnam P., "Reinforced Concrete Structures' Oxford and IBH Publishing Co.

4. Punamia B.C., 'Reinforced Concrete Structures II', Laxmi Publication Pvt. Ltd.
5. Pillai and Menon, 'Reinforced Concrete Design', Tata McGraw Hill, New Delhi.
6. Gray W.S. and Mannings G.L. 'Reinforced Concrete Water Towers, Bunkers, Silos & Grantries', Concrete Publication Limited.
7. Reynolds C.E. and Steadman, J.C., 'Reinforced Concrete Design Hand Book',
8. Relevant IS Codes.

CE 362 (PCC) PUBLIC HEALTH ENGINEERING- I

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Distinguish various sources of water supply and assessment of water quantity and quality.

CO2: Understand treatment of water.

CO3: Understand the procedure of filtration disinfection and water softening.

CO4: Justify type of pipes ,joints in pipe & various valves useful in water supply

CO5: Draw layout of distribution system.

CO6: Process water to meet the quality standards.

***Unit*-I**

Sources of Water Supply: Surface water, ground water, springs, wells & galleries.

Quantity and Quality of Water: Quantity of water per capita, variation in seasonal and hourly consumption. Forecasting of population. Standards of purity for public water supply (I.S. and WHO standards).

Unit -II

Raw Water: Lakes and river intakes, raw water pumping.

Treatment of Water: Aeration, screening, simple sedimentation, Quiescent and continuous flow types of tanks. Coagulation of water, principle of coagulation, coagulation followed by sedimentation, mixing basins.

Unit-III

Filtration: Slow sand filters, rapid sand filters, comparison of two filters.

Disinfection: Treatment with excess lime, ozone, ultraviolet rays, boiling, chlorine and compound of chlorine for disinfection.

Water Softening: Zeolite process, its limitation & advantages.

Unit-IV

Pipes for Water Supply: Different types of pipes used in water supplies.

Joints in Pipes: Bell& spigot joint, cement joint, mechanical joint, flanged joint.

Valves: Air valve, reflux valve, safety valve, sluice valve.

System of Supply: Constant & intermittent supply of water & its disadvantage. Layout of distribution system. Pressure in pipe, water hammer in distribution system.

Practical

1. To determine the total, suspended, dissolved and fixed solid in a given sample.
2. To determine the turbidity of a given sample of water.
3. To determine the odour and colour of a given sample of water.
4. To determine the pH value of a given sample of water.
5. To determine the type and extent of acidity.
6. To determine the carbonate and bicarbonate.
7. To determine concentration of chlorides in the given sample of water.
8. To estimate the hardness of the given sample of water by
9. standard E.D.T.A. method.
10. To determine residual chlorine in a given sample of water.
11. Standards of purity for public water supply. (I.S. and WHO standard)

Suggested Books & References

1. Hussain, S.K., 'Text book of water supply & sanitary engineering ', Oxford & IBH Publishing co. pvt. Ltd., New Delhi.
2. Rangewala, S.C., 'Fundamentals of water supply & sanitary engineering',Charotar Publisher House, Anand.
3. Punmia, B.C.,'Water supply & sanitary engineering'. Laxmi publishers. Jodhpur
4. Garg, S.K., 'Water supply & sanitary engineering', Khanna Publishers. New Delhi.
5. 'Manual on Water Supply and Water treatment', Ministry of Urban Development, Govt. of India, New Delhi

CE 363 (PCC) WATER RESOURCES ENGINEERING

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Analyze surface hydrological data and draw hydrograph and other useful parameters.

CO2: Understand ground water hydrology. Plan reservoirs.

CO3: Select best possible sites for hydrological bodies.

CO4: Design Cross drainage structure and

CO5: Design various types of dams and spillways.

CO6: Understanding working of Hydro power plant.

Unit- I

Surface Water Hydrology: Hydrological Cycle, Types & forms of precipitations. Rainfall measurements & interpretation of rainfall data, missing rainfall data.

Runoff: Factor affecting runoff, annual runoff volume, computation of runoff, infiltration indices.

Hydrograph Analysis: Hydrograph elements and factor affecting. Unit hydrograph & its applications.

Unit- II

Ground Water Hydrology: Ground water aquifers. Permeability & transmissibility of aquifers: steady flow towards a well in confined & water table aquifer (Dupits&Theims equation). Measurement of yield of an open well, tube well & infiltration galleries, interference among wells (well losses, comparison of well and flow irrigation).

Reservoirs: Planning of reservoir, types of reservoir and their site selection, capacity & yield of reservoir, Reservoir sedimentation and useful life of reservoirs.

Unit-III

Gravity Dams: Force acting on a gravity dam, stability requirements, Design and construction features.

Embankment Dams: Suitable sites, causes of failures. Design & stability analysis (flownet, slope stability analysis, precautions of piping).

Spillways: Spillway capacity, flood routing through spillway. Different types of spillways and gate, energy dissipation below spillways.

Unit- IV

Cross Drainage Structure: Necessity of Cross drainage structures, their types and selection, comparative merits and demerits, design of various types of cross drainage structure-aqueducts, syphon aqueduct, super-passage syphon, level crossing and other types.

Hydro Power Plant: Hydro-electric power generation, Hydro-electric plant. General features of hydroelectric projects.

Practical : As per theory syllabus.

Suggested Books & References

1. Asawa,G.L., 'Irrigation Engineering', 2nd Ed. New Age International Publisher. New Delhi.
2. Singh Bharat, 'Fundamental of Irrigation Engineering', 7th Ed, Nem Chand & Bros. Roorkee.
3. Varshney, R.S., GuptaS.C. and Gupta R.L., 'Theory and Design of Irrigation Structures'. Nem Chand and Bros. Roorkee.
4. Arora K.R.,' Irrigation Water Power and Water Resources Engineering', Standard Publishers Distributors

CE364 (PCC) THEORY OF STRUCTURES-II

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Analyze effect of rolling load.

CO2: Analyze the problems of rolling loads with influence line diagram.

CO3: Able to understand & analysis of unsymmetrical Bending.

CO4: Analyze and design of arches.

CO5: Analyze and design of cable and suspension bridges.

CO6: Apply the knowledge to practical civil engineering problems.

Unit-I

Rolling Load: Rolling load on beams and statically determinate frames. Shear force and bending moments due to concerted loads, uniformly distributed loads (longer and shorter than span).

Influence Lines: Influence Line Diagrams for shear force, bending moment, stress, deflection for simple supported beams & statically determinate frames. Muller-Breslau principle and its applications.

Unit-II

Unsymmetrical Bending: Definition, location of Neutral Axis, computation of stresses, shear center and its location for common structural shapes.

Unit-III

Arches: Linear arch, Eddy's theorem. Analysis of three hinged arch & two hinged arches. Moving loads on three hinged and two hinged arches.

Unit-IV

Cable and Suspension Bridges: Analysis of cables with concentrated and continuous loading. Analysis of two & three hinged stiffening girder: Influence lines for Bending Moment and Shear Force.

Practical

1 Analysis of a statically determinate frame for rolling load by influence line diagram.

2 Determination of stresses and shear centre for a beam for unsymmetrical bending.

3 Analysis of three hinged arch.

4 Analysis of two hinged arch

5 Analysis of cables for continuous loading.

6 Analysis of frame without sway by Kani's method.

Suggested Books & References

1. Junarkar,' Mechanics of Structures' Vol. II.
2. Punmia, B.C., 'Strength of materials and Theory of structures' Vol. II.
3. Vazirani & Ratwani, 'Analysis of Structures' Vol. II.

CE365 (PCC) DESIGN OF STEEL STRUCTURES-II

Cr. Hrs. 4(3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Design steel roof truss in different end conditions.

CO2: Design light gauge structures.

CO3: Design plate girder and bearing stiffeners

CO4: Design steel and masonry chimneys.

CO5: Draw influence lines for different type of truss.

CO6: Design different type of truss bridges & lateral bracing.

Unit-I

Roof Truss: Design of steel roof truss including end connections.

Light Gauge Structures: Introduction to design of structures with light gauge sections.

Unit-II

Plate Girder: Design of plate girder under dead & super imposed load, connections flange plate to flange angles & flange angles to web, web and flange, Splicing of web. Intermediate and bearing stiffeners.

Design of masonry chimney stacks excluding their foundation

Unit-III

Design of steel chimney stacks excluding their foundation (Cantilever type).

Influence Lines: Influence lines of Pratt, Warren and 'K' type trusses.

Unit-IV

Steel Bridges: Design of deck type & through type truss bridges for railway loading. Design of lateral bracing.

Note:

1. The use of IS 800, IS: 875, Structural Handbook No.1 shall be allowed in the examination.
2. Use of Railway Bridge Rules and code of practice of steal Bridges (Railway Board) I.R.C. Codes I, II and III, IS 1915, IS 456, SP 16 shall be allowed in the examination.

Design Assignments Shall Consist of the Following

1. Design of Roof Truss
2. Design of plate girder.
3. Design of steel chimney.
4. Design of 'Through type' steel bridge for Railway Loading.
5. Design of 'Deck type' steel bridge for Railway Loading.

- Scaled sketching would be done in the sketch book by hand and then the drawings would be drafted using Drafting Package/ Auto Cad.

- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- Report of a site visit shall be prepared mentioning structural details with relevant sketches of structural connections.

One site visit would be carried out as a part of practical work. Practical Examination would also include a sketching session.

Suggested Books & References

1. Arya & Ajmani, 'Design of Steel Structure'.
2. Punmia B.C., 'Design of Steel Structure'.
8. N. Subramanian., 'Design of steel Structures'.
3. S.S. Bhavikatti, 'Design of Steel Structures'
4. Relevant IS Codes.

CE 366 (PCC) TRANSPORTATION ENGINEERING-II

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credit	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Understand the role of permanent way components.

CO2: Design specific aspect for railway planning.

CO3: Design geometrical features of railway track.

CO4: Select suitable site for airports.

CO5: Design runway for airport & plan of an airport.

CO6: Draw airport layout.

Unit-I

Introduction and Permanent Way Components: Types and selection of gauges. Ideal permanent ways & cross sections in different conditions. Salient features of components (Rails, Sleepers, Ballast, Rail Fastenings). *Study of Specific Aspects:* Coning of wheels, creep, wear, failures in rails, Rail- joints, length of rail. Sleepers (Functions and requirement of ideal sleeper, types of sleeper, sleeper density). Railway stations (site selection and facilities required by passengers). Platforms (goods and passengers). Yards (goods and passengers, marshalling yards).

Unit-II

Geometric Design: Basic principles & factor affecting geometric design of railway track. Gradient, speed, super elevation, cant deficiency, grade compensation.

Points and Crossings: Points & switches, Types of turnouts. Layout plans of different types of crossing.

Railway Systems Specific to Urban Movements: Introduction of surface railway system, Underground system and Elevated System.

Unit-III

Airport Engineering: Airport planning, Airport classifications, Aircraft characteristics (important in planning), Factors in Airport site selection, Obstructions & Zoning laws.

Runway Orientation and Design: Factors affecting, Wind Rose diagram, Cross wind component, Basic runway length, Corrections for elevation and temperature as per ICAO, Types of runway pattern, Runway Layout, Runway & Taxiway width, Gradient, Minimum turning radius.

Unit-IV

Airport Layout and Control: Layout plans of an air-port with single and multiple runways, Planning of Terminal Area (Terminal building), Location of Gates, Aprons and Hangers, Wind direction and Landing direction indicators, Airport lighting system and Airport Drainage System (brief description).

Practical

1. Detailed drawing of a railway station with platform.
2. Detailed drawings of railway track system showing different types of crossing.

3. Detailed drawing showing runway and taxiway of an airport.
4. Basic planning of terminal building of an airport.
5. Site visit for arrangement of various elements.

Note

- Scaled sketching would be done in the sketch-book by hand.
- Report of a site visit shall be prepared.

Suggested Books & References

1. Saxena, S.C. and Arora, S.P., 'A Text Book of Railway Engineering'.
2. Agarwal M.M., 'Railway Engineering'.
3. Mundrey J.S., 'Railway Track Eengineering'.
4. 'Track Manuals of Indian Railways'.
5. Khanna and Arora, 'Airport Engineering'.
6. Rangwala, 'Airport Engineering'.

CE 367(a) (PEC)
PROJECT EVALUATION AND CONSTRUCTION MANAGEMENT

Cr. Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Plan construction projects.

CO2: Prepare job layouts.

CO3: Understand& use network techniques.

CO4: Understand legal aspects of contracts.

CO5: Perform tender operations.

CO6: Demonstrate knowledge of safety in construction & management information System.

Unit- I

*Introduction:*Construction project management frame work, Planning scope objectives & function of project management.

*Construction Planning:*Introduction, different types of planning. Scheduling, methods of scheduling, job planning & job lay outs.

Unit- II

*Network Techniques:*Elements of CPM and PERT as applied to the construction projects. Errors & updating of Network & control of progress.

Unit- III

*Contract Management:*Legal aspect of contracts, laws related to contract, Different types of contract. Elements of tender operation. Contract negotiation & award of work, settlement of disputes.

Unit- IV

*Safety in Construction:*Introduction, Accidents prevention, causes of accidents, safety measure to be followed in various construction work like excavation, demolition, explosive handling, hot bitumen work etc.

*Management Information System:*Concept of Project Management Information System. Benefits of computerized information system.

Practical

1. Work Breakdown Structure (WBS) of a typical construction project.
2. Scheduling and Bar Chart of a typical Boundary Wall Project.
3. Preparation of a network for typical Building Project.
4. CPM Network of a Pipe Line Project.
5. Resource leveling of a Project.
6. Study of a Tender Document.
7. Safety measure at excavation site.
8. Introduction to Project Management Software.
9. Use of Microsoft Excel for Project Management.

Suggested Books & References

1. Chitkara K.K., 'Construction Project Management'.
2. Gupta & Gupta, 'Construction Management & Accounts'.

CE 367 (b) (PEC)
CONSTRUCTION ECONOMICS AND FINANCE

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Acquire knowledge of Economic Terms & Construction Accounting.

CO2: Understand engineering economics.

CO3: Understand benefit-cost analysis.

CO4: Understand pricing and inflation.

CO5: Understand working of capital management.

CO6: Perform risk analysis for a project.

Unit-I

Principles and Explanation of Economic Terms: Land, labour, capital rent, wages, interest, production.

Construction Accounting: Profit & Loss, Balance Sheet, Income statement, Ratio analysis.

Engineering Economics: Time value of money, discounted cash flow, Net Present Value (NPV), Internal Rate of Return (IRR), Price Index (PI).

Unit-II

Benefit-Cost Analysis: Replacement analysis, Break-even analysis. Risks, uncertainties and management decision in capital budgeting.

Unit-III

Work Pricing and Inflation: Cost elements of contract, bidding and award, revision due to unforeseen causes, escalation. Project appraisal and project yield.

Unit-IV

Working Capital Management: Financial plan and multiple source of finance. Budgeting and budgetary control, Performance budgeting, appraisal through financial statements, Project cash flow.

Practical

1. Preparing a double entry Balance Sheet for an organization.
2. Preparing a ledger Sheet for an organization.

3. Cash flow diagram for a construction Equipment.
4. Risk Analysis of a project.
5. Analysis for working capital requirement of a typical construction project.

Suggested Books & References

E. Paul DeGarmo, "Engineering Economy", Macmillan Publishing Company, New York

CE 367 (c) (PEC)
ADVANCED TRANSPORTATION ENGINEERING

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand traffic characteristics.

CO2: Process traffic data.

CO3: Frame statistical methods for traffic engineering.

CO4: Demonstrate knowledge of traffic management and control techniques.

CO5: Evaluate environmental effect on traffic.

CO6: Design road junctions.

Unit-I

Traffic Characteristics: Macroscopic & Microscopic characteristics related to Volume, Speed and Density, Road User Characteristics (Human and vehicular Characteristics).

Traffic Studies: Traffic Volume Studies, Speed Studies, Travel Time & Delay Studies, Origin & Destination, Methodology & Analysis of O-D data, Traffic capacity studies, Accident studies & preventive measures.

Unit-II

Statistical Methods for Traffic Engineering: Elementary concepts and probability, Mean, Standard Deviation and Binomial distribution. Normal

distribution, sampling theory and significance testing, Linear regression and correlation.

Traffic Engineering Design: Principles of Road junction design. Design of Roundabouts. Bus stops and Parking spaces. Design of signals.

Unit-III

Traffic Management: Traffic laws, Regulations and ordinance for Drivers, Pedestrians & Mixed Traffic. Control Measures: One way streets, Kerb Parking control, Intersection Control, Speed Control. Traffic Control Devices (Traffic Markings, Signs, Signals, Traffic Islands), Street Lighting.

Unit-IV

Traffic and Environment: Detrimental effects of Traffic on the environment (air pollution, noise pollution, visual intrusion, aesthetics etc).

Road Safety: The identification of problem, causes and prevention, road layout & improvements, safety equipments.

Practical : As per theory syllabus.

Suggested Book & References

1. L.R. Kadiyali, 'Traffic Engineering and Transportation Planning'.
2. FD Hobes, 'Traffic Planning and Engineering'.
3. Wohl and Martin, 'Traffic System Analysis'.
4. Adolf D May, 'Traffic Flow Fundamentals'.

CE 367 (d) (PEC) OPEN CHANNEL HYDRAULICS

Cr. Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Demonstrate knowledge of fluid flow concepts.

CO2: Understand uniform flow in rigid boundary channels.

CO3: Understand uniform flow in mobile boundary channels.

CO4: Evaluate hydraulic jump.

CO5: Determine characteristics in gradually varied flow.

CO6: Understand the procedure of channel controls and transitions.

Unit-I

Basic Fluid Flow Concepts: Introduction, types of channels and flows, velocity distribution, Pressure distribution, Basic equations, Energy and momentum coefficients.

Unit-II

Uniform Flow in Rigid Boundary Channels: Shear stress distribution, Chezy's and Manning's equations, conveyance, section factor curves for rectangular and trapezoidal channels, flow in circular channel, Relation between conveyance and depth.

Specific energy & critical depth, section factor, hydraulic exponent, applications.

Unit-III

Uniform Flow in Mobile Boundary Channels: Incipient motion condition, Regimes of flow, resistance to flow in alluvial streams.

Gradually Varied Flow: Governing equation, characteristics & classification of surface curves, Computation in prismatic and non prismatic channels.

Unit-IV

Hydraulic Jump: Types of jump, hydraulic jump in horizontal & sloping rectangular channels, location of jump, forced hydraulic jump.

Channel Controls and Transitions: Free over fall, thin plate weirs, broad crested weir, side weir, spillways, sluice gates, standing wave flume.

Practical : As per theory syllabus.

Suggested Books & References

1. K.G. Ranga Raju, 'Flow Through Open Channels'.
2. K. Subramanya, 'Flow in Open Channels'.

CE 367 (e) (PEC) RURAL WATER SUPPLY & SANITATION

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand Village Community in India & Rural water supply.

CO2: Demonstrate knowledge of sources and water treatment methods.

CO3: Apply techniques for Fly and Mosquito Control

CO4: Demonstrate knowledge of Rural Sanitation.

CO5: Understand the transfer of communicable diseases and take preventive measures

CO6: Demonstrate knowledge of Milk and Food Sanitation.

Unit– I

Rural Water Supply: Importance of Village Community in India (condition of Indian villages with special regard to economic, social & health aspects). Quality of water needed for village community (human& cattle population & their water requirement standards of potable water).

Sources of Water: Sources of water for village water supplies (surface water, ground water, springs & wells). Types of wells, disinfection of wells. Different types of pumps used for village wells.

Unit– II

Treatment of Water: screening, plain sedimentation, filtration & disinfection, desalination, de fluoridation.

Communicable Diseases: Disease and immunity, communicable disease sources. Mode of transfer. Control of communicable diseases.

Unit – III

Fly and Mosquito Control: Life cycle of flies & mosquitoes. Various methods of fly & mosquito control.

Milk and Food Sanitation: Essentials of dairy farm and cattle shed sanitation. Tests for milk and dairy products. Food epidemics. Food poisoning.

Unit – IV

Rural Sanitation: Village latrines, storm water &sullage problem, animal waste, methods of composting, bio gas. Collection and disposal of waste (septic tank, percolation pits, subsurface disposal). Digestion of methane & manure recovery.

Practical : As per theory syllabus.

Suggested Books & References

1. Hussain, S.K., 'Text book of water supply & sanitary engineering ', Oxford & IBH Publishing co. pvt. Ltd., New Delhi.
2. Rangewala, S.C., 'Fundamentals of water supply & sanitary engineering',Charotar Publisher House, Anand.
3. Punmia, B.C.,'Water supply & sanitary engineering'. Laxmi publishers. Jodhpur
4. Garg, S.K., 'Water supply & sanitary engineering'
5. Steel, E.W., 'Municipal Rural Sanitation'.

CE 367 (f) (PEC) ADVANCED FOUNDATION ENGINEERING

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Determine bearing capacity under various conditions.

CO2: Design and analyze pile foundation.

CO3: Perform test on soils for different foundation.

CO4: Determine deflection in soils and foundations.

CO5: Use provisions defined by Indian Standard Code for settlement analysis.

CO6: Design and analyze well foundation.

Unit-I

*Shallow Foundation:*Methods of estimation of bearing capacity. Computation of bearing capacity factors, effect of eccentric and inclined loads effect of water table on bearing capacity. Mayerhof's analysis, Bearing capacity of stratified soils. Methods of estimation of settlement of footings. Limits of settlement for various structures. Indian Standard Code Provisions (IS: 1904,6403-8009).

Unit-II

Bearing Capacity: Determination for allowable bearing capacity as per IS code. Schemartman's method. Dee beer's and Mortin method of finding out settlement from static cone penetration test. Methods of finding out bearing capacity from plate load tent, standard penetration test data.

Unit-III

Pile Foundations: Types of pile and their use. Modes of failure. Bearing capacity and settlement pile foundation. Types of piles. Allowable load. Pile load test. Dynamic and static formulae. Bearing capacity factors. Pile under lateral loading. Winklers assumption. Pile resistance and deflection under lateral loads, elastic method, Broms method.

*Raft Foundation:*Semi empirical method of Design of raft foundation.

Unit-IV

*Expansive Soils:*Behaviour of expansive soil. foundation practice, under reamed piles. Methods of finding out load carrying capacity of under reamed piles in clayey and sandy soil. Provision of IS 2911 Part III-1980. for design of under reamed pile foundations.

Well Foundations: Design and construction. Bearing capacity, settlement and lateral resistance. Tilts and shifts, IS and IRC codes methods.

Practical : As per theory syllabus.

Suggested Books & References

1. Bowles, 'Design and construction of foundation'.
2. Prakash,Ranajan& Saran, 'Design of foundation and retaining structures'.
3. Tomlinson, 'Foundation Enginnering'.
4. Swami Saran, 'Analysis and design of Substructures'.
5. Relevant IS codes.

FOURTH YEAR B.TECH. (VI SEMESTER)

CE471 (PCC) ESTIMATING AND COSTING

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credits	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Prepare estimates and reports.

CO2: Acquire knowledge of rate analysis of building.

CO3: Calculate quantity of material used in building, road and canal earthwork.

CO4: Calculate valuation of building and rent fixation.

CO5: Perform valuation of items.

CO6: Understand and apply GST rules to construction industry.

Unit-I

Estimating: Objects & general principles for estimating &costing.Types of estimates. Rules & methods of measurement. Procedure for estimating. Various items of work in building construction. General considerations for preparing report.

Unit-II

Specification: Types of specification (Brief and detail). Detailed specification for building works. Detailed specification for canal & road works items.

Rate Analysis: Concepts of rate analysis. Requirements of an item for analysis of rate. Quantity calculation of materials for an item. Calculation of labour (task of labour as per N.B.O.) & Overhead cost.

Unit-III

Calculation of Quantity: Various formulae for calculation of quantity of concrete, bricks & reinforcement. Earth work calculations of roadwork for level & side hill sections (two level) only. Calculations of quantity of Road works.

Canal Earthwork: Balancing depth of earthwork in a canal. Use of L-section & cross-section for earthwork calculations of quantity of materials for canal lines.

Unit-IV

Accounting: Accounting & procedure of works, classification of works. Contract & contract document. Tender; Notice for inviting tenders (NIT), opening of tenders, processing of tenders. Running & final bill, earnest money, security money & measurement book. General discussion of a works department.

Valuation : Purpose of valuation, , Scrap value, Salvage value, Market value, Book value, Annuity capitalized value. Methods of calculating depreciation (Straight line & Sinking fund method), Valuation of a building, rent fixation.

Introduction to GST in India, relevant to construction industry.

Practical

1. Blue print reading & finding dimensions for quantity calculations.
2. Use of Long-wall & Short-wall methods of estimation for a building.
3. Use of Centre line method of estimation for a building.
4. Earthwork in excavation & masonry work in foundation & up-to plinth.
5. Detailed estimates for super structure items, wood work, plasters etc..
6. Estimate of R.C.C and steel work for - Slab - beam – column & trusses.
7. Rate analysis & preparation of bills – Data analysis of rates for various items of works – abstract estimates Building projects – submission & execution.
8. Estimates of simple structures (under ground tank).
9. Detailed estimate of small residential building (two roomed)
10. Earthwork calculation for Road work – earthwork in cutting / filling. Detailed estimate for WBM, Bituminous road.
11. Estimate of Slab Culvert- including all the components
12. Earthwork Calculation for canal works in embankment & cutting.

Suggested Books & References

1. Datta B.N., 'Estimating and Costing in Civil Engineering Theory and Practice'**,** Publishing Distributors Ltd., New Delhi.
2. Birdi, 'Estimating and costing in Civil Engineering', DhanpatRai& Sons, New Delhi.
3. Bellis H.F. & Schmidt, W.A., 'Architectural Drafting', McGraw-Hill Book Co. Inc., London.

CE 472 (PCC) PUBLIC HEALTH ENGINEERING-II

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand types of sewage and its Disposal techniques.

CO2: Design of sewers system.

CO3: Carriy out sewage treatment methods.

CO4: Solid waste management.

CO5: Determine the chemical oxygen demand

CO6: Identify the sewage problems in locality and provide solutions.

Unit -I

Sewage Disposal: Introduction, systems of sewage disposal, conservancy system & water carriage system. Separate, Combined and partially separate system, their advantage & disadvantage. Suitability of separate sewerage system for India. Manhole, drop manhole. Shape of sewers. Laying the sewers.

Unit -II

Design of Sewers: Quantity of sewage, provision for future population, Quantity of storm water, design of sewers, Estimating storm water by time of concentration method. Testing of sewer line. Cleaning of sewers.

Preliminary Treatment: screening, disposal of screening, skimming tank, grit chamber, disposal of grit.

Unit -III

Sewage Treatment: Principle of sewage, sedimentation, filtration, intermittent sand filter, introduction of trickling filter. Advantage & disadvantage of trickling filter.

Unit -IV

Introduction of Solid Waste Management: General, classification of municipal solid waste, quantity of waste generation. Objectives of solid

waste management. Environmental problem associated with solid waste. Activities associated with generation of solid waste. Factors affecting solid waste. Introduction of sanitary land filling.

Practical

1. To determine the amount of dissolved oxygen in the given sample of water by Winkler method.
2. To determine 5 day BOD of a given sample of effluent.
3. To determine the quality of Alum required to coagulate a given sample of water by jar test.
4. To determine the chemical oxygen demand (COD) of given sample of effluent.
5. Introduction of separate combined & partially separate system.
6. Design of sewers.
7. Estimating storm water by time of concentration methods.
8. Introduction of disposal alternatives: Sanitary land filling.
9. Composting & incineration.
10. Visit to a local polluted site.

Suggested Books & References

1 Hussain, S.K., 'Text book of water supply & sanitary engineering ', Oxford & IBH Publishing co. pvt. Ltd., New Delhi.

2 Rangwala, S.C., 'Fundamentals of water supply & sanitary engineering', Charotar Publisher House, Anand.

3 Punmia, B.C.,'Water supply & sanitary engineering'. Laxmi publishers. Jodhpur

4 Garg, S.K., 'Water supply & sanitary engineering', Khanna publishers. New Delhi.

5 'Standard Methods for the examination of water and waste water', 19th edition, prepared and published jointly by ALPHA, AWWA, WEF.

CE 473 (PCC)
IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand need of Irrigation.

CO2: Identify environmental impacts of irrigation projects.

CO3: Demonstrate knowledge of canal Irrigation and water logging.

CO4: Identify and solve water logging problems.

CO5: Design diversion headwork.

CO6: Demonstrate knowledge of different type of falls, drainage systems.

Unit- I

*Irrigation Practices:*Need for Irrigation in India, scope (soil moisture & plant growth). System of irrigation (surface & subsurface irrigation method). Irrigation water quality, water requirements & irrigation scheduling of crops. Duty & Delta (Base period-relationship). Irrigation efficiencies. Assessment of irrigation water. Environmental impact of irrigation projects

Unit-II

*Canal Irrigation:*Sediment Transport; Importance & Mechanics of transport, Estimation of bed load & suspended load. Design of channels in India, regime channels, Kennedy and Lacey's theory.

Water Logging: Water logging & salt efflorescence, causes, effects & control measures (canal lining).

Unit- III

Diversion Head Works: Design for surface and subsurface flows (Bligh's and Khosla's methods). Selection of site layout of different parts of a diversion headwork. Types of weirs and barrages, design of weirs on permeable foundation, silt excluders and different types of silt ejectors. Energy dissipation.

Regulator: Types of canals head regulators, cross regulator.

Unit-IV

Falls: Classification of falls, Design of falls.

Canal Transitions: Cross drainage works. Flood control works (flood forecasting-methods).

River Training Works: sediment control and silt exclusion devices, Escape bed bars.

*Drainage:*Necessity, reclaimation of land and water resources. Surface and sub surface drainage system and their design.

Practical: As per theory syllabus.

Suggested Books & References

1. S.K. Garg, 'Irrigation Engineering & Hydraulic Structures', Khanna Publishers
2. V.T. Chow, 'Open Channel Hydraulics', McGraw Hill Publishing Co
3. Satyanarayana Murthy, C, 'Design and Drawing', New Age International Publishers.
   Modi& Seth, 'Fluid Mechanics and Hydraulic Machinery', Standard Publications.

CE 474 (PCC) BRIDGE ENGINEERING

Cr. Hrs. 4 (3+0+1)

	L	T	P
Credits	**3**	**0**	**1**
Hours	**3**	**0**	**2**

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

CO1: Understand different types of bridges and their suitability and their maintenance.

CO2: Select optimum sites for bridge construction.

CO3: Design culverts bridges.

CO4: Design T-beam bridges.

CO5: Design substructure elements

CO6: Design bearing of slab bridges and joints as per IRC 83.

Unit-I

Introduction: Type of bridges & classification of road & railways bridges. Economical span. IRC loadings for bridges, wind load & Earthquake forces. Various load distribution theories.

Investigation for Bridges: Site selection and preliminary data.

Maintenance: Maintenance of bridges.

Unit-II

Reinforced Concrete Culverts & Bridges: Design of reinforced concrete slab culvert, T-beam bridges (Courbons& Hendry-Jaegar methods) for IRC Loading. Use of Pigeaud's coefficients.

Unit-III

Substructure: Principle of design of substructure elements, Design of pier, abutment and wing wall**.**

Design of Foundation: Introduction of Well foundation.

Unit-IV

Bearing: Introduction about bearings for slab bridges and girder bridges. Design of elastomeric bearings as per IRC 83 (Part II).

Joints: Expansion joints.

Note: 1. The use of IS 800, IS: 875, Structural Handbook No.1 shall be allowed in the examination.

Design Assignments shall consist of the following:

1. Design of Slab culvert.
2. Design of T-beam bridge.
3. Design of substructure elements for T-beam bridge.

- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- To the scale sketching would be done in the sketch book by hand.
- Report of a site visit shall be prepared mentioning structural details with relevant sketches of structural connections.

Site visit would be carried out as a part of practical work. Practical Examination would also include a sketching session.

Suggested Books & References

1. Victor Johnson, 'Bridge Engineering'.
2. Relevant IRC codes.

Note: The use of IRC Book shall be allowed in the examination.

CE 475 (a) (PEC)
REPAIR AND REHABILITATION OF CONCRETE STRUCTURES

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Understand deterioration of concrete Structures.

CO2: Understand corrosion of Reinforcement.

CO3: Investigate of deteriorated structures & N.D.T

CO4: Demonstrate knowledge of materials for Repair.

CO5: Use practice codes for repairs.

CO6: Apply repair techniques on damaged structures.

Unit-I

Deterioration of Concrete Structures: Causes of Deterioration: permeability, carbonation, sulphate attack, chloride attack, alkali-aggregate reaction, corrosion. Factors affecting deterioration (environment, cover, types of constituent material, cement content, W/C ratio & workmanship). Preventive measures.

Cracks: Factors contributing cracks in concrete. Type of cracks & pattern.

Unit- II

Corrosion of Reinforcement: Anodic, cathodic reaction, chloride ion presence, factor affecting corrosion, Codal provisions for limiting chloride content, Methods for corrosion measurement and assessment: Half cell potential and Resistivity.

Dewatering: Dewatering of the foundation trenches (Pumping providing sumps & side drains, cement grouting chemical grouting).

Damp Proofing: Objective, materials used for damp proofing. General principles of damp proofing methods.

Unit- III

Investigation of deteriorated structures: Preliminary test methods (visual observation).

*N.D.T.*Non destructive test methods for concrete: Rebound hammer, ultrasonic pulse velocity, penetration techniques and pull out test.

Unit-IV

Materials for Repair: Properties, selection criterion, Types of material (polymers and resins).

Special Repair Techniques: Grouting, shotcrete& under water repair: materials, equipments, precautions process etc.

Practical: As per theory syllabus.

Suggested Books & References

1. Bungey and Milard, 'Testing of concrete structures'.
2. Allen & Edward, 'The repair of concrete structures'
3. Mehta, PK &. Monteriro, P.J.M 'Concrete Microstructure, Properties and Materials'.
4. Neville, 'Properties of Concrete'.

CE 475 (b) (PEC) TALL BUILDINGS

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Calculate different loads acting on a building.
CO2: Analyze frames.
CO3: Design tall structures with provision of strength against wind loads.
CO4: Design and analyze infilled frames.
CO5: Analyze shear walls.
CO6: Design earthquake resistant buildings.

Unit-I

Introduction to Tall Building: Classification of tall buildings. Types of loads: Gravity load, wind load, seismic load & combination of loads. Floor systems. Structural forms.

RC Frames: Introduction to rigid frame system.

Unit-II

Analysis of Frames: Gravity load: Substitute frame method for dead load and live loads.

Lateral Load: Approximate method for wind load (Factor method).

Infilled Frames: Behaviour of the frames. Forces in the infill and frame. Design of infill.

Unit-III

Shear Wall: Behaviour of shear wall systems. Interaction of shear wall & frames. Introduction to coupled shear walls.

Unit-IV

Earthquake Resistant Buildings:[Introduction]Response of a tall building to ground motion. Response Spectrum Method. Codal provisions for earthquake resistant buildings (IS 1893:2002).

Practical : As per theory syllabus.

Suggested Books & References

1. Smith, B.S. and Coull A., 'Tall buildings Structures: Analysis and Design', John Wiley and Sons.
2. Schuller, Wolfgang, 'High rise Buildings Structures', John Wiley and Sons.
3. SarwarAlamRaz, 'Analytical methods in Structural Engineering', Wiley Eastern Private Limited, New Delhi
4. Relevant IS Codes.

CE 475 (c) (PEC) DESIGN OF PRE-STRESS STRUCTURES

Cr. Hrs. 3(2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Demonstrate knowledge of pre-stressed concrete and process of pre-stressing.

CO2: Analyze of sections by load balancing and strength concept.

CO3: Design simply supported beams of rectangular and flanged sections for flexure and shear as per I.S. code (using limit state design).

CO4: Design of end blocks. Transmission & Anchorage zone stresses (Anchorage zone renforcement).

CO5: Design of two spans continuous beam.

CO6: Analyze composite structures.

Unit- I

Basics of Pre-stressed Concrete: Concepts, materials, various pre-tensioning and post tensioning systems, losses in pre-stressing. Concept of partial pre-stressing. Machinery and equipments of pre-stressing.

Analysis: Analysis of sections (Stress concept, Load balancing concept and Strength concept).

Unit- II

Design: Design of simply supported beams of rectangular and flanged sections for flexure and shear as per I.S. code (using limit state design).

Unit- III

End Blocks: Design of end blocks. Transmission & anchorage zone stresses (Anchorage zone renforcement).

Continuous Beams: Analysis of continuous beams of two spans. Concept of cable profile.

Unit- IV

Indeterminate Structures: Design of continuous beams (Two Span).

Composite Construction: Analysis for flexural stresses and strength of composite members.

Note: The use of IS 1343 shall be allowed in the examination.

Practical

1. Analysis of losses.
2. Design of Simple supported beam for flexure and shear.
3. Design of Flanged section beam for flexure and shear.
4. Design of End block.
6. Analysis of continuous beams of two spans.
7. Design of two span continuous beams.
8. Site visit for structural arrangement of members.

Note

- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- To the scale sketching would be done in the sketch book by hand.
- Report of a site visit shall be prepared mentioning structural details with relevant sketches of structural connections.

Suggested Books & References

1. Lin T.Y. 'Design of Pre-stress concrete structures'.
2. Krinsharaju N, ‘Pre-stressed concrete’, Tata Mcgraw Hill, New Delhi.
3. Ramamurtham, 'Pre stress concrete'.
4. Edward Nawy, 'Pre-stressed Concrete Structures'
5. Relevant IS Codes.

CE475 (d) (PEC) DESIGN OF INDUSTRIAL STRUCTURES

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Design connections for industrial steel structures.

CO2: Design industrial buildings.

CO3: Design multi story buildings of steel: simple industrial and mill buildings.

CO4: Design steel chimneys.

CO5: Design steel bunkers, silos.

CO6: Design light gauge structures.

Unit-I

Connections: Design of semi rigid connections (column and bracket connections).

Design of Industrial Buildings: Analysis and design of major components; Roof truss, gantry girders, gable girder, side rails.

Unit-II

Multi-story Buildings: Design of multi story buildings of steel: simple industrial and mill buildings.

Unit-III

Chimneys: Design of steel chimneys.

Unit-IV

Bunkers and Silos: Design of steel bunkers and silos.

Light-gauge Structures: Design of steel light gauge structures.

Note: The use of IS 800, IS: 875, Structural Handbook No.1 shall be allowed in the examination.

Practical

1. Design of a industrial building
2. Design of a multi story buildings of steel (simple industrial and mill buildings).

3. Design of a steel chimney.
4. Design of a steel bunkers and silo.
5. Site visit for structural arrangement of members.

Note :

- Detailing of parts would be done as per standard professional practice and relevant IS codes.
- To the scale sketching would be done in the sketch-book by hand.
- Report of a site visit shall be prepared mentioning structural details with relevant sketches of structural connections.

Suggested Books & References

1. Gaylord and Gaylord,' Steel Design'.
2. Arya & Ajmani, Design of Steel Structures'.
3. Ramchandra, 'Design of Steel Structures'.
4. Relevant IS Codes.

CE 475 (e) (PEC)
EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

CO1: Demonstrate knowledge earthquakes, causes and past events.

CO2: Understand the effects of earthquake and various zones in India.

CO3: Response to earthquake.

CO4: Design of earthquake resistant building.

CO5: Use practice codes for safe designs.

CO6: Apply response spectrum method to sesmic design of structures.

Unit-I

Earthquakes: Introduction to earthquakes, causes of earthquakes, Indian past earthquakes. Types of earthquake waves, Epi-centre, Hypo-centre, focus, magnitude, intensity of earthquake.

Unit-II

Effect of Earthquake: Consequence of Earthquake Seismic zones of India, Seismic Instruments. Dynamic loads on structures due to earthquake. Damages to various Civil Engineering Structures.

Unit-III

Response to Earthquake: Response to harmonic and periodic dynamic loading, Force distribution on flexible and rigid floor systems in a building. Mode super position method.

Unit-IV

Design: Principles of Earthquake Resistant Design, Application of response spectrum method to seismic design of structures, Codal provisions for design and ductility.

Note: The use of IS 1893 shall be allowed in the examination.

Practical: As per theory syllabus.

Suggested Books & References

1. Anil K. Chopra, 'Structural Dynamics'.
2. Agrawal and Shrikhadi, ‘Earthquake Resistant Design of Structures’
3. Arya, 'Timber & Masonry structures including Earthquake resistant design'.
4. Clough &Penzien, 'Structural Dynamics'.
5. Mario Paz, 'Structural Dynamics'.
6. Relevant IS Codes.

Open Electives to be offered in 7th Semester with code ___478 (OE)

CS 478 (OE)
INTRODUCTION TO CYBER SECURITY

Cr. Hrs.	**3 (3 + 0)**		
	L	**T**	**P**
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

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

CO1: Describe and analyze the term ethics related to cyber security.

CO2: Evaluate designs related to ethical hacking, penetration testing, privacy and security of system.

CO3: Analyse and compare symmetric-key encryption public-key encryption schemes based on different security models

CO4: Identify issues to protect digital assets in compliance with cyberwarfare.

Prerequisite: Prior knowledge of using open source operating system, shell programming, open source security tools and ability to design a cryptosystem is desirable.

Unit – I

Introduction to Ethics: the field of ethics, how it differs from either law or religion, why it is still necessary when we have both law and religion; The Ethical Frameworks: introduction to three stances applied to thinking about ethics: virtue ethics, utilitarianism, and deontological ethics.

Unit – II

The Ethical Hacker: Introduction to the notion of ethical hacking, the hacker code and the particular problem of penetration testing; The Problem of Privacy: What is privacy?, how is it different from security?, ethical issues related to privacy.

Unit – III

Cryptography Techniques: Plain Text and Cipher text, Substitution techniques, Transposition techniques, Encryption & decryption, Computer-based Symmetric key Cryptography Algorithms: Algorithms types and modes, overview of symmetric key cryptography, data encryption standards

(DES), Advance encryption standards (AES), Shannon's theory of confusion and diffusion. Computer- based Asymmetric key Cryptographic Algorithms: RSA algorithms, MD5 Digital Signature.

Unit – IV

The Problem of Surveillance: Introduction to surveillance, types of surveillance, surveillance practices; The Problem of Piracy: the problem of piracy and intellectual property theft.

Problem of Cyberwarfare: What is cyberwarfare?, the players involved, ethics of cyberwarfare; The Way Forward: some thoughts about what a Code of Ethics contains and what it means to practice professionalism in one's craft, future of cyber security, introduction to some ethical issues.

Text Books/References

1. "Cybersecurity Ethics: An Introduction", Mary Manjikian, Taylor & Francis Group.
2. "Cybersecurity and Cyberwar: What everyone needs to know", P. W. Singer and Allan Friedman, Oxford University Press.
3. "Cryptography and Network Security", Atul Kahate, Tata McGraw-Hill Publishing Company Ltd.
4. "Cryptography and Network Security", William Stallings, Pearson Asia.

MI 478 (a) (OE) ENGINEERING GEOLOGY

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

Identify the structure of earth; Distinguish between different rocks and their properties; Select sites for different structures in different zones and Explore subsurface using different techniques

Unit-I

General Geology: Subdivision of Geology. Importance of Geology in Civil Engineering. Internal Structure of the Earth, physical properties of minerals, weathering and erosion. Geological work of wind, river and

ocean. Stratigraphic aspects of rocks for civil engineers. Geological Time Scale, rock provinces.

Unit-II

Petrology: Origin & classification of rocks. Texture & Structures of Igneous, Sedimentary and Metamorphic Rocks. Engineering Properties of rocks. Rocks and dimensional stones as a construction material. Suitability of rocks for different Civil Engineering purposes. Structural Geology: Causes & Classification of fold, fault, joints & unconformities. Outcrop pattern. Recognition of structure from rock outcrops.

Unit- III

Natural Disasters and Geological Investigations (in reference to Civil Engineering): Earthquake, its causes, intensity scale and seismic zone of India. Site selection for dam, tunnels, multistoried buildings, reservoirs and bridge structures Improvement Techniques: Sites improvement techniques practiced in different civil engineering projects. Introduction to drilling methods.

Unit-IV

Geophysical Methods for Subsurface Exploration: Electrical resistivity, Seismic refraction & Ground Penetrating Radar method of civil engineering importance. Remote Sensing: Introduction and applications in Civil Engineering. Image acquisition, image interpretation (visual and digital, digital terrain model, airborne lithological identification). Remote sensing software used in civil engineering interpretation.

Practical: As per theory part

Text Books/References

1. Goodman, R. E., 'Engineering Geology - Rock in Engineering Construction', John Wiley and Sons.
2. Parbin Singh, 'Text Book Engineering Geology'.
3. Blyth, F.G. and De Freitas, M.H., 'A Geology for Engineers', (7th Edition), Edward Arnold.
4. N.Chenna Kesavulu, 'Text Book of Engineering Geology'.
5. Leggot R.F., 'Geology for Engineers'.
6. Kryinine & Judd, 'Engineering Geology and Geo-techniques'.
7. John Pitts, 'Manual of Geology for Civil Engineers'.
8. Tony Waltham, 'Foundations of Engineering Geology

MI 478 (b) (OE) EARTH MOVING MACHINERY

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

Understand construction and working of various heavy earth moving machinery, pumping system used in mines, maintenance aspects

Unit-I

Construction and operation of blast hole drills, rippers, shovels, hydraulic excavators, scraper, dragline, dumpers, wheel loaders, dozers, graders, surface miners, BWE, spreader, stacker & reclaimer.

High capacity belt conveyors – constructional detail and selection procedures; High angle conveyor, Cable belt conveyor;

Unit-II

Aerial rope ways – classification, layout and constructional features.

Classification, application and constructional features of crushers, breakers and feeders; In pit crushers.

Compressors: Basic theory, classification and application of compressors used in mines; Construction and operation of centrifugal and axial flow compressors; Performance characteristics of compressors; Selection of compressors for mining application.

Unit-III

Centrifugal Pumps: Principle of operation; theoretical and actual head, construction of impeller, multistage centrifugal pumps, axial thrust balancing, performance characteristics, parallel and series operations of pumps, capacity, selection of mine pumps; Pumping system layout for mines.

Construction and operation of slurry, submersible, air lift and mono pumps; installation and maintenance of pumps.

Unit-IV

Recent trends and development of surface mining equipment: Automation and control in HEMM. Selection criteria of open cast mining equipment. Safety aspects related to open cast mining equipment: Fire protection system used in HEMM.

Faults and their rectification in HEMM and their maintenance.

Practical: As per theory syllabus.

Text Books/References

1. Surface Mining Technology– S. K. Das;Geeta Book Stores
2. Elements of Mining Technology– D.J. Deshmukh; Vidyasewa Prakashan
3. Mine, Pumps, Haulage & Winding– S. Ghatak; Coalfield Publishers, Asansol
4. Conveying machines; Part I & II – A. Spivakovsky, V. Dyachkov; Mir Publishers, Moscow
5. Recent Development of Heavy earth Moving machineries – A. De, Lovely Prakashan
6. Moving the Earth – Nicholes
7. On and with the Earth – J. Singh
8. Drilling Technology Handbook– C. P. Chugh

MI 478 (c) (OE) TUNNELING ENGINEERING

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

Understand various methods of tunneling, use of latest numerical techniques for tunnel design, stability analysis and ground control measures with various steel support and rock reinforcement, maintenance of tunnels, provision of facilities such as ventilation, illumination etc in tunnels.

Unit-I

Introduction to tunneling; geological concept of tunneling. Influence of geological aspects on design & construction of tunnels.

Unit-II

Tunnelling Methods: Conventional and special Drill & blast roadway drivage machines, tunnel boring machines (TBM)

Unit-III

Stresses and displacements associated with excavating tunnels, Ground control or treatment in tunneling and drivages. Design of Supports of Tunnels; Steel supports, rock enforcements, new Australian tunneling methods (NATM).

Unit-IV

Design of Tunnels: Rock conditions, RMR, Q-system, RSR, rock mass behavior, stress strain behavior, and stress analysis of tunnels. Maintenance: Dewatering, ventilation and illumination drivages tunnels. Numerical techniques: Introductory use of FLAC, PLAXIS etc.

Practical: As per theory

Text Books/References

1. Richards E. Bullock – Tunnelling and Underground Construction Techniques
2. Stack Barbara – Hand Book of Mining and Tunnelling Machinery, John Wiley & Sons.
3. R.V. Proctor – Rock Tunneling with Steel Supports
4. J. Johnsen – Modern Trends in Tunneling and Blast Design.

ME478(a) (OE)
ENTREPRENEURSHIP AND INDUSTRIAL MANAGEMENT

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Upon completion of this course the students will be familiar with:

CO1: Selection and development of a small or medium business idea

CO2: Make and Implement project proposals and reports to hunt for venture capital etc.

CO3 Market competition and innovation in products and processes.

CO4: Develop managerial skills to achieve goals, & Plan and implement projects applying management techniques.

CO5: Understand social responsibility as a modern management concept.

Unit-I

Entrepreneurship: Definition and Meaning; Characteristics of Entrepreneurship / Traits of an Entrepreneur; Functions of Entrepreneurship - Job Creation, Innovation, Inspiration, Economic Development; Types of Entrepreneurship, Entrepreneurship and Intrapreneurship, Entrepreneurship Strategy

The Business Plan: Creating and Starting the Venture: The Marketing Plan, The Financial Plan, Sources of Capital; Legal Issues for the Entrepreneur: Patents, Trademarks, Copyrights, Trade Secrets, Licensing, Product Safety and Liability, Insurance; Contracts, Advertising, Supply Chain Management, Retail & FDI

Proposals & risks: Project Report Preparation (Feasibility, Cost Estimation, CVP Analysis, Detailed Project Report, Concept of Risk and decision making, Risk Management-SWOT etc

Unit-II

Entrepreneurship and Innovation: The Innovation Concept, Importance of Innovation for Entrepreneurship, Source of Innovation for

Opportunities, The Innovation Process, Product life cycle, new product development process, mortality curve, Creativity and innovation in product modification/ development

Entrepreneurship and Economic Development: Role of Entrepreneurship in Modern Economy, Managers Vs Entrepreneurship**:** Characteristic of Managers, Characteristic of Entrepreneurs, Similarities and differences between Managers and Entrepreneurs

Unit-III

Industry, Commerce and Business: Types of ownership in the organization- Definition, characteristics, Merits & Demerits; Single ownership, Partnership, Cooperative Organizations, Joint Stock Companies, Government owned, Differences between Management and Administration, Leadership Models.

Industry Size & Current schemes: Micro, Small, Medium- Industry; Registration Process, Current Promotional Schemes for new Enterprise

Unit-IV

Function of Management: Planning- Types of Planning - Strategic Plan, Tactical Plan and Operation Plan; Organizing- Definition and Meaning, Types of Organizing; Staffing- Definition and Meaning, Types of Staffing – Internal & External, The Basic Steps in the Staffing Process; Directing (Leading)- Definition and Meaning; Controlling**-** Definition and Meaning, Relationship between Planning and Controlling.

Social Responsibility: Social Obligation, Social Responsiveness and Social Responsibility, Managerial Ethics

Practical: As per theory

Text Books/References

1. Entrepreneurship Development and Management, A. K. Singh, Jain Book Agency (JBA) publishes, New Delhi.
2. Small Scale Industries and Entrepreneurship, Vasant Desai, Himalaya 2008.
3. Industrial Engineering and Management, O.P.Khanna, Dhanpat Rai and Sons, Delhi.
4. Industrial Management and Entrepreneurship, V. K. Sharma, Scientific Publishers, New Delhi.
5. Entrepreneurship, Roy Rajeev, Oxford Latest Edition.

ME478(b) (OE) BIO-ENERGY SYSTEMS DESIGN

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Upon completion of this course the students will be familiar with:

CO1: Classifybioenergy fuels and their conversion technologies.

CO2: Describe the knowledge for operation of biomass gasifier, biomass pyrolysis and biogas plant.

CO3 Design system for biomass gasification, pyrolysis and biogas production.

CO4: Demonstrateproduction of biodiesel and bioethanol, and their application power generation and transportation.

CO5: Demonstrate socio-economic aspects and cost-economics analysis of biomass conversion technologies.

Unit – I

Introduction: Introduction to bio-energy from, classification of biomass as fuel – Agro based, Forest, residue. Bio-energy systems/Conversion devices – Incinerators, gasifiers, digestors.Design objectives for sustainable bio-energy systems.Bio-mass bricketing machine.

Biomass conversion processes, Thermo chemical conversion, Direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion.

Unit – II

Bio-mass Combustion: Basics of combustion, Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit – III

Bio-mass Gasification: Working principle, Gasifiers – Fixed bed system – Downdraft and updraft gasifiers,Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Bio-mass Pyrolysis: Pyrolysis – types, slow, fast; Manufacture of charcoal: methods -yields and application; Manufacture of pyrolytic oils and gases, yields and applications.

Unit – IV

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status, Design and constructional features; Biomass resources and their classification for biogas.

Review of mechanical Design: Materials of Construction, corrosion damage, testing and inspection.

System modelling: Basics and its mathematical model, Use of Software in system design. Economicsanalysis of bio-energy systems.

Practical: As per theory.

Text books/ References

1. PrabirBasu, Biomass Gasification, Pyrolysis and Torrefaction: Practical Design and Theory, Academic Press, Elsevier, 2018.
2. John Rezaiyan, Nicholas P. Cheremisinoff, Gasification Technologies, Taylor & Francis, 2005.
3. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
4. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
5. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
6. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

ME478(c) (OE)
ENERGY CONSERVATION AND MANAGEMENT

Cr. Hrs. 3 (2+0+1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcomes: Upon completion of this course the students will be familiar with:

CO1: To understand the basic knowledge ofdifferent terms & principles of energyconservation,audit and management

CO2: To understand efficient heat utilization, saving andrecovery in different thermal system

CO3 To prepare energy audit report fordifferent energy conservation instances

CO4: To Evaluate the energy saving &conservation in different mechanical utilities

Unit - I

Energy Scenario: Commercial and Non-Commercial Energy, Primary Energy Resources, Commercial Energy Production, Final Energy Consumption, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy and Environment: Air Pollution, Climate Change, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.

Unit - II

Energy Management & Audit: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments.

Financial Management: Investment-need, Appraisal and criteria, Financial analysis techniques- Simple pay back period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis; Financing options, Energy performance contracts and role of ESCOs.

Unit - III

Energy Monitoring and Targeting: Defining monitoring & targeting, Elements of monitoring & targeting, Data and information-analysis, Techniques -energy consumption, Production, Cumulative sum of differences (CUSUM).

Global Environmental Concerns: United Nations Framework Convention on Climate Change (UNFCC), Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), Prototype Carbon Fund (PCF), Sustainable Development.

Unit - IV

Energy Efficiency in Thermal Utilities and systems: Boiler efficiency calculation, evaporation ratio and efficiency for coal, oil and gas, Boilers: Types, combustion in boilers, performances evaluation, analysis of losses, Condensate and flash steam recovery system, identifying opportunities for energy savings, Cupola, non-ferrous melting, Induction furnace, performance evaluation of a furnace, hot air generators, Feed water treatment, blow down, energy conservation opportunities, Furnaces: Classification, general fuel economy measures in furnaces, excess air, heat distribution, Soot blowing and soot deposit reduction, reasons for boiler tube failures, start up, shut down and preservation, Steam System: Properties of steam, assessment of steam distribution losses, steam leakages, steam trapping, Steam utilization, Performance assessment more details, installation, Temperature control, draft control, waste heat recovery. Forging furnace heat balance, Thermic fluid heaters, super critical boilers, Thermo-compressor, steam pipe insulation, condensate pumping, steam dryers.

Cogeneration: Definition, need, application, advantages, classification, saving potentials. Heat balance, steam turbine efficiency, tri-generation, micro turbine. Heat Exchangers: Types, networking, pinch

analysis, multiple effect evaporators, condensers, distillation column, etc. Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential. Insulation and Refractories: Insulation-types and application, economic thickness of insulation, heat savings and application criteria, Refractory-types, selection and application of refractories, heat loss. Cold insulation. Heating, ventilation, air conditioning (HVAC) and Refrigeration System: Factors affecting Refrigeration and Air conditioning system performance and savings Opportunities. Vapor absorption refrigeration system: Working principle, types and comparison with vapor compression system and saving potential, heat pumps and their applications, section on ventilation system, ice bank system, and performance assessment of window and split room air conditioners, Star labeled pumps, cold storage refrigeration, and humidification system.

Practical: As per theory

Text Books/References:

1. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press
2. Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press
3. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4
4. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication
5. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation dited byE J Wilson and D Gerard, Blackwell Publishing
6. Heating and Cooling of Buildings - Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, 1994

EC 478(a) (OE) INTELLECTUAL PROPERTY RIGHTS

Cr. Hrs. 3(3+0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand the concept of Intellectual Property Rights and Patents.

CO2: Understand the concept of Trademark and its related Statutory authorities.

CO3: Apprehend the idea of Copyright and registerability of a design.

CO4: Understand International IPR, Case laws and World intellectual property organization.

Unit-I

Introduction: Concept of IPR, Historical development , kinds of IPR, brief description of patent, trademark, copyright ,industrial design, importance of IPR, IPR authorities.

PATENTS: Introduction, Indian Patent Act 1970 &2002, Protectable subject matter--patentable invention, Procedure for obtaining patent, Provisional and complete specification Rights conferred on a patentee, transfer of patent, Revocation and surrender of patents, Infringement of patents, Action for infringement, Patent agents, Patent in computer programs.

Unit-II

Trademark: Introduction, Statutory authorities, principles of registration of trademarks, rights conferred by registration of trademarks, Infringement of trademarks and action against infringement, procedure of registration and duration, licensing in trademark.

Unit-III

Copyright: Introduction, Author and ownership of copyright, rights conferred by copyright ,term of copyright, assignment/licence of copyright, Infringement of copyright ,remedies against infringement of copyright, registration of copyright, copyright enforcement and societies

Industrial design: The design act-2000, registerability of a design, procedure of registration of a design, piracy of a registered design, Case law on designs.

Unit-IV

International IPR & case laws: World intellectual property organization, WCT, WPPT, TRIPS, Copyright societies, international IPR dispute resolution mechanism. Case laws.

Text Books/References

1 Law Relating to Intellectual property, fourth edition by B.L.Wadehra .Universal law publishing co. pvt. Ltd, 2007.

2 Intellectual property: Patents, copyright, trademarks and allied rights. Fifth edition by W.R. Cornish. Sweet & Maxwell publisher, 2003.

3 Law and practice of intellectual property in India by VikasVashishth, 2006

4 Patents ,copyrights, trademarks and design by B L Wadhera, 2014.

5 Dr. B. L. Wadhera, "Intellectual Property Law Handbook". Universal Law Publishing2002.

EC 478 (b) (OE) E-COMMERCE

Cr. Hrs. 3(3+0+ 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcomes: The student will be able to

CO1: Understand the concept of Electronic Commerce and its need.

CO2: Understand the idea of Network Infrastructure for E- Commerce.

CO3: Apprehend the notion of security issues on web and importance of Firewall.

CO4: Understand Electronic Payments, SET protocol and E-Commerce Law.

Unit-I

Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models

Unit-II

Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, and FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.

Unit-III

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Unit-IV

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

Text Books/References

1 Goel, Ritendra “E-commerce”, New Age International, 2007.

2 Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison- Wesley. 1996.

3 Vinod Kumar Garg and Venkita krishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI 2004.

EE 478(a) (OE) KNOWLEDGE BASED SYSTEM

Cr. Hrs. 3 (3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome :

CO1: Know-how of Artificial neural networks.

CO2: Proficiency in learning techniques of artificial neural networks.

CO3: Know-how of fuzzy control techniques.

CO4: Capability to Adaptive Fuzzy control design.

Unit - I

Artificial Neural Networks: Neural Networks- an overview, Introduction to Artificial Neural Networks (ANN), Historical Development of Neural Networks, Biological Neural Networks, Comparison Between Artificial and Biological Neural Network. Basic Building Blocks of ANN: Network Architecture, , Activation Function.

Unit - II

Fundamental Models of Artificial Neural Networks: Introduction, McCulloch-Pitts Neuron Model. Learning Rules: Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS) Rule), Back Propagation Rule.

Unit - III

Fuzzy Logic: Fuzzy logic concepts and application areas, classical and fuzzy Sets, fuzzy relation and membership functions, fuzzification and defuzzification methods, fuzzy rule base system.

Unit - IV

Neural Network and Fuzzy Logic application in load forecasting, fault detection, economic load dispatch, voltage and reactive power control, load flow and electric drive control.

Text Books/References

1. S N Sivanandanm, S Sumathi and S N Deepa. Introduction to Neural Networks Using MATLAB- Tata McGraw- Hill Publishing Company Limited.

2. J.M. Zurada. Introduction of artificial neural systems - Jaico Publication House.

3. D. Driankov, H. Hellendoorn and M Rein frank. An introduction to fuzzy control - Narosa Publication House, 2nd reprint.

EE 478 (b) (OE) ADVANCED POWER CONVERTERS

Cr. Hrs. 3 (3 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome :

CO1: Competency in Single-Switch Isolated Converters design**.**

CO2: Proficiency in Dynamic Analysis of DC-DC Converters

CO3: Know-how of resonant converter.

CO4: Know-how of Multilevel Converters**.**

Unit - I

Single-Switch Isolated Converters: Requirement for isolation in the switch-mode converters, Forward and flyback converters, Push-Pull Converters Power circuit and steady-state analysis,.

Unit - II

Dynamic Analysis of DC-DC Converters: Formulation of dynamic equation of buck and boost converters, averaged circuit models, linearization technique, small-signal model and converter transfer functions.

Unit - III

Resonant Converters: Classification of Resonant converters-Basic resonant circuits- Series resonant circuit-parallel resonant circuits-Resonant switches. Concept of Zero voltage switching.

Unit - IV

Multilevel Converters: Basic concept, classifications, working principle, applications.

Text Books/References

1. Switched Mode Power Conversion, Course Notes, CCE, IISc, 2004.
2. Issa Batarseh, 'Power Electronic Circuits', John Wiley, 2004.
3. Philip T Krein,' Elements of Power Electronics ',Oxford Press.
4. Fundamentals of Power Electronics – Robert Erickson and Dragon Maksivimovic.
5. Springer Publications. Power Electronics–IssaBatarseh- John Wiely.
6. Elements of Power Electronics-Philip T.Krein–Oxford University Press.

EE 478(c) (OE)
POWER ELECTRONICS IN RENEWABLE ENERGY SYSTEMS

Cr. Hrs. 3 (3+0 + 0)

	L	T	P
Credit	**3**	**0**	**0**
Hours	**3**	**0**	**0**

Course Outcome :

CO1: Learning of Basics Renewable Energy Systems.

CO2: Proficiency in Dynamic modelling of Power Electronics converter.

CO3: Know-how of power electronics in Wind Power Plants.

CO4: Know-how of power electronics in Solar PV.

Unit - I

Basics Renewable Energy Systems : Modern power electronics technology for the integration of renewable energy sources. challenges for grid integration,energy needs of India and energy consumption patterns, worldwide potentials of these sources.

Unit - II

P**ower electronics converters**: Various topologies of power electronics converters (PECs), power electronics converters (PEC) classifications, Dynamic modelling of Power Electronics converter

Unit - III

Power electronics in Wind Power Plants: Grid interconnection requirements for wind farms, integration issues, operational issues, grid integration issues in India, wind power integration standards, super grid strategy, Applications of PEC in wind power plants, Modern PEC in wind power plants.

Unit - IV

Solar Photo Voltaic (PV) Technology: Solar cell characteristics, parameters of solar cell and its equivalent circuit, PV Module and arrays, perturb and observe maximum power point tracking (MPPT) technique, components of PV system, design of a standalone PV system. solar constant, solar radiation at the earth's surface, solar radiation geometry, solar radiation measurements, estimation of average solar radiation. Solar Thermal Systems: Types of collectors, collection systems and efficiency.

Text Books/References

1. Wind power plants and projects developments, Joshua Earnest and T Wizelius, PHI, New Delhi, 2011.
2. Handbook of renewable energy technology, World Scientific, Siongapore, 2011.

REE 478(OE): RENEWABLE ENERGY TECHNOLOGIES

Cr. Hrs. 3 (2+0 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome:

This course is undertaken to introduce basic aspects of renewable energy supply presenting fundamental characteristics of the resource base (solar, wind energy, bio energy, etc.) and principles of related technical systems (photovoltaic, wind, biomass power generation, etc.). In a further step an economic analysis of supply technologies will be undertaken. Students will learn to acquire a basic understanding of issues related to renewable energy supply systems.

Unit - I

Conventional and Alternative Energy Sources: Effect on environment of fossilfuels, nuclear energy and hydroelectric power. Energy consumption pattern & energy resources in India. Renewable energy options, potential and utilization.

Unit - II

Solar Energy: Solar thermal and Photovoltaic System for power generation. Flat platecollectors & Focusingcollectors. Solar water and air heaters, solar distillation, solar cooker, drying of materials, application in industries.

Unit - III

Wind Energy: Nature and potential, wind mill types, their merits and demerit. Wind farms. Brief description of geothermal energy, ocean thermal energy, tidal and wave energy.

Unit - IV

Biomass: Nature and potential, different bio conversion techniques, biogas, biodiesel. Power generation from biomass (gasification &dendro thermal) and fuel cell technology.

Practical

1. To study solar drying system.
2. To study solar water heating system.
3. To study box type solar cooker.
4. To study solar distillation system.
5. To study different biogas plants.
6. To study wind energy conversion systems.
7. To study downdraft biomass gasifier for thermal application.

Suggested Readings

1. G.D. Rai. Non Conventional Energy Sources, 2013, Khanna Publishers.
2. Twidell, J., & Weir, T. (2015). *Renewable energy resources*. Routledge.
3. Basu, Prabir. *Biomass gasification and pyrolysis: practical design and theory*. Academic press, 2010.
4. Rathore N. S., Kurchania A. K., Panwar N. L.;Non Conventional Energy Sources, Himanshu Publications, 2000.

SWE478(OE) AERIAL PHOTOGRAPHY, RS and GIS

Cr. Hrs. 3 (2 +0+ 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

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

Familiarize with aerial photographs and its interpretation. Developing skill of use of various hardware and software in use of satellite data, GPS technology. Development of resource mapping and planning studies using RS and GIS.

Unit - I

Aerial photography- aerial photograph, their classification, map v/s aerial photograph, photogrammetry and its application. Elements of aerial photo interpretation, aerial photo interpretation and its use.

Unit - II

Remote sensing- definition, electromagnetic radiations,Interactions with the Atmosphere,Passive v/s Active Sensing, Characteristics of Images, Satellite and Sensors-Satellite Characteristics, Resolution, Multi-spectral Scanning, Thermal Imaging, Satellite missions, microwave sensing, Image Analysis- Visual interpretation, Digital image processing, image, Enhancement and Classification.

Unit - III

GIS- definition, basic components, data types- spatial, non- spatial, GIS data modeling, vector and raster representation, GIS data base management, GIS data file management.

Unit - IV

GIS data input and editing- data input methods, scanning, digitization, GPS data, data editing, errors and data reduction, Data analysis- format conversion, spatial measurement, overlay analysis and data output.

Practical

1. Study of aerial photographs under mirror stereoscope.
2. Preparation of stereo model of aerial photograph.
3. Land use/cover studies through aerial photograph.
4. Use of optical scanners and digitizers. U
5. Use of GPS in mapping and GIS data input, satellite data product.
6. Familiarization with image processing and GIS software's and their applications.

Suggested Readings

1. K.K. Rampal. (1999) Hand Book of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi.
2. M. A. Reddy (2002) Remote Sensing and Geographical Information Systems, B.S. Publications, Hyderabad.
3. Lillisand and Kiefer (1987) Remote sensing and Image Interpretation, John Weiley and sons.

FMP 478(OE) : MACHINERY FOR LAND DEVELOPMENT

Cr. Hrs. 3 (2 +0 + 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will have the knowledge of different earth moving machineries used for land development operation.

Unit-I

Land leveling-Criteria for land leveling, plane profile and inspection, engineering fundamentals related to earth-moving machinery.

Unit-II

Earth moving and excavation machines classification and application of bulldozers, advantage and disadvantage, straight and angle bulldozers, moving earth with bulldozers and estimation of output of a bulldozer numerical problems.

Land clearing equipments, Power shovel: Construction and operation of power shovel size selection of power shovel factors affecting the output of a power shovel.

Unit-III

Scraper: Types, construction and operation of scrapers, size of the scraper, cycle time production rates of scrapers, numerical problems, load-growth curve and estimation of output of a scraper.

Dragline: Types of dragline, size basic parts and operation of a dragline, output of a dragline, estimation of output, effect of different factors on output, numerical problems.

Clam shell: Basic parts and operation of a clam shell, application, size and output of a clam shell.

Motor grader: Construction and operation of motor grader, application, basic adjustment parameters of major grader, output of motor grader,

Unit-IV

Trenching machines: types, construction and operation of wheel and ladder type trenching machines, selection of suitable equipment for excavating trenches and production rates of trenching machines.

Practical

1. Study of various components of bulldozers
2. Study of various components of Scraper:
3. Study of various components of Dragline
4. Study of various components of Clam shell
5. Study of various components of Scraper: Motor grader
6. Study of various components of Scraper: Trenching machines.

Suggested Readings

1. R.L. Peurifoy. Construction, Planning, Equipment and Methods.
2. Mahesh Verma. Construction equipment and its planning and application.
3. Jagman Singh. Heavy construction, planning, equipment and methods.
4. A.M. Michael. Irrigation theory and practices.

PFE 478(OE) : PACKAGING MATERIALS AND METHODS

Cr. Hrs. 3 (2 +0+ 1)

	L	T	P
Credit	**2**	**0**	**1**
Hours	**2**	**0**	**2**

Course Outcome: At the end of the course, the student will be able to acquaint with various packaging materials, various aspects of packaging methods and technology.

Unit-I

Factors affecting package material, Packaging, requirement, importance and scope, frame work of packaging strategy, environmental considerations, Packaging systems, types: flexible and rigid; retail and bulk; levels of packaging.

Unit-II

Different types of packaging materials, their key properties and applications, metal cans, plastic packaging, different types of polymers used in packaging and their barrier properties. Manufacture of plastic packaging materials; glass containers, types of glass used in food packaging, manufacture of glass and glass containers, closures for glass containers. Paper and paper board packaging, modification of barrier properties and characteristics of paper/ boards.

Unit-III

Labeling on packages, shrink and cling packaging, vacuum and gas packaging; active packaging, factors affecting the choice of packaging materials, disposal and recycle of packaging waste, printing and labeling; lamination.

Unit-IV

Package testing, testing methods for flexible materials, rigid materials and semi rigid materials; Tests for paper, glass containers, metal containers.

Practical

1. Identification of different types of packaging materials.
2. Determination of tensile / compressive strength of given material/package.
3. Vacuum packaging of agricultural produces.
4. Determination of tearing strength of paper board.
5. Measurement of thickness of packaging materials.
6. To perform grease-resistance test in plastic pouches.
7. Determination of bursting strength of packaging material.
8. Determination of water-vapour transmission rate.
9. Shrink wrapping of various horticultural produce.
10. Testing of chemical resistance of packaging materials.
11. Determination of drop test of food package and visit to relevant industries.

Suggested Readings

1. Coles R., McDowell D. and Kirwan, M.J. 2003. Food Packaging Technology, Blackwell Publishing Co.
2. Gosby, N.T. 2001. Food Packaging Materials, Applied Science Publication
3. John, P.J. 2008. A Handbook on Food Packaging, Narendra Publishing House,
4. Mahadevia, M., Gowramma, R.V. 2007. Food Packaging Materials, Tata McGraw Hill
5. Robertson, G. L. 2001. Food Packaging and Shelf life: A Practical Guide,Narendra Publishing House.
6. Robertson, G. L. 2005. Food Packaging: Principles and Practice, Second Edition, Taylor and Francis Pub.

Notes