M.D. UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION

Bachelor of Technology

Scheme effective from 2018-19

SEMESTER 1st (COMMON FOR ALL BRANCHES)

Sr. No.	Category	Course Notation	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
					L	T	P			Mark of Class work	Theory	Practical	Total	
1	Basic Science Course	A	Refer to Table 1	Physics-1	3	1	0	4	4	25	75		100	3
		B	BSC-CH-101G	Chemistry-1	3	1	0	4	4	25	75		100	3
2	Basic Science Course	C	Refer to Table 2	Mathematics-I	3	1	0	4	4	25	75		100	3
3	Engineering Science Course	A	ESC-EE-101G	Basic Electrical Engineering	3	1	0	4	4	25	75		100	3
	Engineering Science Course	B	Refer to Table 3	Programming for Problem Solving	3	0	0	3	3	25	75		100	3
4	Engineering Science Course	A	ESC-ME-101G	Engineering Graphics & Design	1	0	4	5	3	25		75	100	3
		B	ESC-ME-102G	Workshop Technology	1	0	0	1	1	25	75		100	3
5	Basic Science Course	A	Refer to Table 1	Physics Lab-1	0	0	3	3	1.5	25		25	50	3
		B	BSC-CH-102G	Chemistry Lab-1	0	0	3	3	1.5	25		25	50	3
6	Engineering Science Course	A	ESC-EE-102G	Basic Electrical Engineering Lab	0	0	2	2	1	25		25	50	3

		B	Refer to Table 3	Programming in C Lab	0	0	4	4	2	25		25	50	3
7	Engineering Science Course	B	ESC-ME-103G	Manufacturing Practices Lab	0	0	4	4	2	25		25	50	3
8	Humanities and Social science including Management courses	C	HSMC-ENG-101G	English	2	0	0	2	2	25	75		100	3
TOTAL CREDIT									**19.5**	**175/200**	**300/375**	**125/75**	**600/650**	

M.D. UNIVERSITY

SCHEME OF STUDIES AND EXAMINATION

Bachelor of Technology

Scheme effective from 2018-19

SEMESTER 2nd (COMMON FOR ALL BRANCHES)

Sr. No.	Category	Course Notation	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
					L	T	P			Mark of Class work	Theory	Practical	Total	
1	Basic Science Course	B	Refer to Table 1	Physics-1	3	1	0	4	4	25	75		100	3
		A	BSC-CH-101G	Chemistry-1	3	1	0	4	4	25	75		100	3
2	Basic Science Course	C	Refer to Table 2	Mathematics-II	3	1	0	4	4	25	75		100	3
3	Engineering Science Course	B	ESC-EE-101G	Basic Electrical Engineering	3	1	0	4	4	25	75		100	3
	Engineering Science Course	A	Refer to Table 3	Programming for Problem Solving	3	0	0	3	3	25	75		100	3
4	Engineering Science Course	B	ESC-ME-101G	Engineering Graphics & Design	1	0	4	5	3	25		75	100	3
		A	ESC-ME-102G	Workshop Technology	1	0	0	1	1	25	75		100	3
6	Basic Science Course	B	Refer to Table 1	Physics Lab-1	0	0	3	3	1.5	25		25	50	3
		A	BSC-CH-102G	Chemistry Lab-1	0	0	3	3	1.5	25		25	50	3
7	Engineering Science Course	B	ESC-EE-102G	Basic Electrical Engineering Lab	0	0	2	2	1	25		25	50	3

		A	Refer to Table 3	Programming in C Lab	0	0	4	4	2	25		25	50	3
8	Humanities and Social science including Management courses	C	HSMC-ENG-102G	Language Lab	0	0	2	2	1	25		25	50	3
9	Engineering Science Course	A	ESC-ME-103G	Manufacturing Practices Lab	0	0	4	4	2	25		25	50	3
TOTAL CREDIT									**18.5**	**200/175**	**225/300**	**175/75**	**600/500**	

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Important Notes:

1. Significance of the Course Notations used in this scheme
   C = These courses are common to both the groups (Group-A and Group –B).
   A = Other compulsory courses for Group-A.
   B = Other compulsory courses for Group-B.

Course code for different branches

Table 1

Sr. No.	Course Name	Course Code	Branch
1.	Introductionto Electromagnetic Theory	BSC-PHY-101G	• Electronics and Communication Engineering • Electronics and Computer Engineering • Electronics and Telecommunication Engineering • Mechanical Engineering • Fire Technology and Safety Engineering • Mechanical and Automation Engineering • Automobile Engineering
2.	WavesandOptics& QuantumMechanics	BSC-PHY-102G	• Electrical Engineering • Electronics and Electrical Engineering
3.	Semiconductor Physics	BSC-PHY-103G	• Computer Science Engineering • Information Technology • Computer Science and Information Technology
4.	Mechanics	BSC-PHY-104G	• Civil Engineering • Printing Technology
5.	Optics, Optical Fibre, Magnetism and Quantum Mechanics	BSC-PHY-105G	• Bio-Technology Engineering • Textile Technology • Textile Chemistry • Fashion and Apparel Engineering
6.	Introduction to Electromagnetic Theory (IEMT) Lab	BSC-PHY-111G	• Electronics and Communication Engineering • Electronics and Computer Engineering • Electronics and Telecommunication Engineering • Mechanical Engineering • Fire Technology and Safety Engineering • Mechanical and Automation Engineering • Automobile Engineering
7.	Wave Optics & Quantum Mechanics Lab	BSC-PHY-112G	• Electrical Engineering • Electronics and Electrical Engineering
8.	Semiconductor Physics Lab	BSC-PHY-113G	• Computer Science Engineering • Information Technology • Computer Science and Information Technology
9.	Mechanics Lab	BSC-PHY-114G	• Civil Engineering • Printing Technology
10.	Optics, Optical Fibre,	BSC-PHY-115G	• Bio-Technology Engineering

	Magnetism and Quantum Mechanics (OFMQ		• Textile Technology • Textile Chemistry • Fashion and Apparel Engineering

Table 2

Sr. No.	Course Name	Course Code	Branch
1.	Math-I (Calculus and Matrices)	BSC-MATH-101G	• Mechanical Engineering • Electronics and Communication Engineering • Civil Engineering • Electrical Engineering • Electronics and Electrical Engineering • Printing Technology • Automobile Engineering • Mechanical and Automation Engineering • Electronics and Computer Engineering • Fire Technology and Safety Engineering • Electronics and Telecommunication Engineering • Textile Technology • Textile Chemistry • Fashion and Apparel Engineering
2.	Math-I (Calculus and Linear Algebra)	BSC-MATH-103G	• Computer Science Engineering • Information Technology • Computer Science and Information Technology
3.	Math-I (Series, Matrices and Calculus)	BSC-MATH-105G	• Bio-Technology Engineering
4.	Math-II (Multivariable Calculus, Differential equations and Complex Analysis)	BSC-MATH-102G	• Mechanical Engineering • Electronics and Communication Engineering • Civil Engineering • Electrical Engineering • Electronics and Electrical Engineering • Printing Technology • Automobile Engineering • Mechanical and Automation Engineering • Electronics and Computer Engineering • Fire Technology and Safety Engineering • Electronics and Telecommunication Engineering • Textile Technology • Textile Chemistry

			• Fashion and Apparel Engineering
5.	Math-II (Probability and Statistics)	BSC-MATH-104G	• Computer Science Engineering • Information Technology • Computer Science and Information Technology
6.	Math-II (Vector Calculus, Differential equations and Laplace Transform)	BSC-MATH-106G	• Bio-Technology Engineering

Table 3

Sr. No.	Course Name	Course Code	Branch
1.	Programming for Problem Solving	ESC-CSE101G	• Computer Science and Engineering • Electronics and communication Engineering • Information Technology • Computer Science and Information Technology • Electronics and Electrical Engineering
		ESC-CSE102G	For all remaining branches of B.Tech
2.	Programming in C Lab	ESC-CSE103G	• Computer Science and Engineering • Electronics and communication Engineering • Information Technology • Computer Science and Information Technology • Electronics and Electrical Engineering
		ESC-CSE104G	For all remaining branches of B.Tech

I. **Mandatory Induction program**

(Please refer **Appendix-A** for guidelines. Details of Induction program also available in the curriculum of Mandatory courses.)
[Induction program for students to be offered right at the start of the first year.]

3 weeks duration

- Physical activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent People
- Visits to local Areas
- Familiarization to Dept./Branch & Innovations

Course code	BSC-PHY-101G				
Category	Basic Science Course				
Course title	**Introduction to Electromagnetic Theory**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	3	**1**		**4**	
Branches (B. Tech.)	• Electronics and Communication Engineering • Electronics and Computer Engineering • Electronics and Telecommunication Engineering • Mechanical Engineering • Fire Technology and Safety Engineering • Mechanical and Automation Engineering • Automobile Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT – I

Electrostatics in vacuum and linear dielectric medium

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential Boundary conditions of electric field and electrostatic potential; energy of a charge distribution and its expression in terms of electric field.

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement.

UNIT - II

Magnetostatics

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating It for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

Magnetostatics Ina linear magnetic medium: Magnetization and associated bound currents; auxiliary magnetic field; Boundary conditions on **B** and **H**. Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials.

UNIT - III

Faraday's law and Maxwell's equations

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law; energy stored in a magnetic field.

Continuity equation for current densities; Modified equation for the curl of magnetic field to satisfy continuity equation; displacement current and magnetic field arising from time-dependent electric field; Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector.

UNIT - IV

Electromagnetic waves

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

Suggested Reference Books

1. David Griffiths, Introduction to Electrodynamics, Pearson Education
2. ICFAI, Electricity and Magnetism, Pearson Education
3. Halliday and Resnick, Physics
4. W. Saslow, Electricity, magnetism and light
5. S.K. Chatterjee, Fundamentals of Electricity and Magnetism- PHI
6.A Mahajan, A Rangwala, Electricity and Magnetism

Course code	BSC-PHY-102G				
Category	Basic Science Course				
Course title	**Waves and Optics & Quantum Mechanics**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	3	**1**		**4**	
Branches (B. Tech.)	• Electrical Engineering • Electronics and Electrical Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT – I

Wave and Light Motion

Waves: Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator, forced mechanical and electrical oscillators, impedance, steady state motion of forced damped harmonic oscillator

Non-dispersive transverse and longitudinal waves: Transverse Wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their Eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves.

Light and Optics: Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave.

UNIT – II

Wave Optics and Lasers

Wave Optics: Huygens' principle, superposition of waves and interference of light by wave-front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer. Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity.

UNIT – III

Introduction to Quantum Mechanics

Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle.

Solutionofstationary-stateSchrodingerequationforonedimensionalproblems–particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Scattering from a potential barrier and tunneling; related examples like alpha- decay, field-ionization and scanning tunneling microscope, tunneling in semiconductor structures.

UNIT – IV

Introduction to Solids and Semiconductors

Free electron theory of metals, Fermi level, density of statesin1, 2 and 3 dimensions, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands. Types of electronic materials: metals, semiconductors, and insulators. Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p -n junction.

References:

1. E. Hecht, "Optics", Pearson Education
2. D. J. Griffiths, "Quantum mechanics", Pearson Education
3. B.G. Streetman, "Solid State Electronic Devices", Pearson Education
4. G. Main, "Vibrations and waves in physics", Cambridge University Press
5. H. J. Pain, "The physics of vibrations and waves", Wiley
6. A. Ghatak, "Optics", McGraw Hill Education,
7. O. Svelto, "Principles of Lasers", Springer Science & Business Media,
8. R. Robinett, "Quantum Mechanics", OUP Oxford
9. D. McQuarrie, "Quantum Chemistry", University Science Books
10. D. A. Neamen, "Semiconductor Physics and Devices", Times Mirror High Education Group, Chicago
11. E.S. Yang, "Microelectronic Devices", McGraw Hill, Singapore

Course code	BSC-PHY-103G				
Category	Basic Science Course				
Course title	**Semiconductor Physics**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	3	**1**		**4**	
Branches (B. Tech.)	• Computer Science Engineering • Information Technology • Computer Science and Information Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Prerequisite: "Introduction to Quantum Mechanics" Desirable

UNIT - I
Electronic Materials

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT - II
Semiconductors

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

UNIT - III
Light-Semiconductor Interaction

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

UNIT - IV
Measurements & Engineered Semiconductor Materials

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-Vis spectroscopy, absorption/transmission.

Densityofstatesin2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Heterojunctions and associated band-diagram.

References:

1. Pierret, Semiconductor Device Fundamental,
2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Pearson Education
3. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-HillInc.
4. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc.
5. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley
6. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York.
7. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
8. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Course code	BSC-PHY-104G				
Category	Basic Science Course				
Course title	**Mechanics**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	3	**1**		**4**	
Branches (B. Tech.)	• Civil Engineering • Printing Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Prerequisites: (i) High-school education

UNIT I

Vector Mechanics of Particles

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates.

UNIT II

Mechanics of Particles in Motion and Harmonic Motion

Potential energy function; F=-Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a forcefield; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler problem; Application: Satellite maneuvers.

Non-inertial frames of reference; Rotating coordinate system: Five-term acceleration formula. Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum;

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance.

UNIT III

Rigid Body Mechanics

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

Introduction to three-dimensional rigid body motion—only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and(b) Moment of inertia tensor; Three-dimensional motion of a rigid body where in all points move in a coplanar manner: e.g. Rod exe cutting conical motion with center of mass fixed—only need to show that this motion looks two-dimensional but is three-dimensional, and two-dimensional formulation fails.

UNIT IV
Statics of Solids

Free body diagrams with examples on modelling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases; Force-displacement relationship; Geometric compatibility for small deformations; Illustrations through simple problems on axially loaded members like trusses.

Suggested Reference Books

1. Shames/Rao: Engineering Mechanics: Statics and Dynamics, Pearson Education
2. Hibbler, Engineering Mechanics, Pearson Education
3. Engineering Mechanics, 2^{nd}ed. — MK Harbola
4. Sinha, Engineering Mechanics, Pearson Education
5. Introduction to Mechanics — MK Verma
6. An Introduction to Mechanics — D Kleppner& R Kolenkow
7. Principles of Mechanics — JL Synge & BA Griffiths
8. Mechanics — JP Den Hartog
9. Engineering Mechanics - Dynamics, 7^{th}ed. - JL Meriam
10. Mechanical Vibrations — JP Den Hartog
11. Theory of Vibrations with Applications — WT Thomson

Course code	BSC-PHY-105G				
Category	Basic Science Course				
Course title	**Optics, Optical Fibre, Magnetism and Quantum Mechanics**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	3	**1**		**4**	
Branches (B. Tech.)	• Bio-Technology Engineering • Textile Technology • Textile Chemistry • Fashion and Apparel Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Objectives:

Basic concepts of optics and its applications, electricity and magnetism, and quantum physics.

UNIT – I

Optics

Diffraction: Introduction to interference and example; concept of diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits; diffraction grating, characteristics of diffraction grating and its applications.

Polarisation: Introduction, polarization by reflection, polarization by double refraction, scattering of light, circular and elliptical polarisation, optical activity.

UNIT – II

Fibre Optics and Lasers

Fibre Optics: Introduction, optical fibre as a dielectric wave guide: total internal reflection, numerical aperture and various fibre parameters, losses associated with optical fibres, step and graded index fibres, application of optical fibres.

Lasers: Introduction to interaction of radiation with matter, principles and working of laser: population inversion, pumping, various modes, threshold population inversion, types of laser: solid state, semiconductor, gas; application of lasers.

UNIT – III

Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, electric current and the continuity equation, laws of magnetism. Ampere's Faraday's laws. Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar dielectrics, applications of dielectric

Magnetisation, permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

UNIT – IV

Quantum Mechanics

Introduction to quantum physics, black body radiation, explanation using the photon concept, photoelectric effect, Compton effect, de Broglie hypothesis, wave-particle duality, Born's interpretation of the wave function, verification of matter waves, uncertainty principle, Schrodinger wave equation, particle in 1-D box.

Course outcomes

Students will be familiar with

·Bragg's Law and introduced to the principles of lasers, types of lasers and applications

·Various terms related to properties of materials such as, permeability, polarization, etc.

·Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties of materials

·Simple quantum mechanics calculations

References:

1.I. G. Main, "Vibrations and waves in physics", Cambridge University Press, 1993.

2.H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.

3.E. Hecht, "Optics", Pearson Education, 2008.

4.A. Ghatak, "Optics", McGraw Hill Education, 2012.

5.O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.

6.D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.

7.R. Robinett, "Quantum Mechanics", OUP Oxford, 2006.

8.D. McQuarrie, "Quantum Chemistry", University Science Books, 2007.

9. D. A. Neamen, "Semiconductor Physics and Devices", Times Mirror High Education Group, Chicago, 1997.

10.E.S. Yang, "Microelectronic Devices", McGraw Hill, Singapore, 1988.

11.B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.

Course code	BSC-PHY-111G				
Category	Basic Science Lab Course				
Course title	**Introduction to Electromagnetic Theory (IEMT) Lab**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
			3	**1.5**	
Branches (B. Tech.)	• Electronics and Communication Engineering • Electronics and Computer Engineering • Electronics and Telecommunication Engineering • Mechanical Engineering • Fire Technology and Safety Engineering • Mechanical and Automation Engineering • Automobile Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Students will be required to learn to take readings of vernier calliper, screw gauge, spherometer, spectrometer etc. during their orientation labs at the starting and **will have to perform at least ten subject related experiments in a semester.**

Basic experiments on least count and error estimation (during orientiation)

- To aware about the least count of varnier calliper and screw gauge and to find the thickness of a slide using varnier calliper and diameter of wire using screw gauge.
- Calculation of radius of curvature of a convex surface using spherometer.
- Angel measurement using spectrometer.

List of Subject related Experiments:

1. To study Hall effect in semiconductors and measure the Hall coefficient.

2. To find frequency of AC mains using sonometer.

3. To study the magnetic properties of materials using B-H curve.

4. To study the Curies temperature of materials using Dielectric set up.

5. To verify the inverse square law with the help of a photovoltaic cell.

6. To determine Planks constant using photocell.

7. To study the characteristics of Solar cell and find out the fill factor.

8. To design and study Active and Passive filters.

9. To find impedance and Q factor using LCR circuit.

10. To study resonance phenomena in LCR circuit.

11. To measure e/m of electron using helical method.

12. To find temperature co-efficient of platinum using Callender Griffith bridge.

13. To study the forward and reverse characteristics of P-N junction diode.

14. To study the reverse characteristics of Zener diode and voltage regulation using Zener Diode.

Course code	BSC-PHY-112G				
Category	Basic Science Course				
Course title	**Wave Optics & Quantum Mechanics Lab**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
			3	**1.5**	
Branches (B. Tech.)	• Electrical Engineering • Electronics and Electrical Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Students will be required to learn to take readings of vernier calliper, screw gauge, spherometer, spectrometer etc. during their orientation labs at the starting and **will have to perform at least ten subject related experiments in a semester.**

Basic experiments on least count and error estimation (during orientation)

- To aware about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
- Calculation of radius of curvature of a convex surface using spherometer.
- Angel measurement using spectrometer.

List of Subject related Experiments:

1. To find out wavelength of monochromatic light using Newton's ring experiment.
2. To find out wavelength of monochromatic light using Diffraction grating.
3. To find out wavelength of monochromatic light using Freshnel's bi-prism
4. To study interference phenomena using Michelson's Interferometer and to find out wavelength of monochromatic light.
5. To find specific rotation of sugar using Polarimeter
6. To find thickness of hair using He-Ne laser.
7. To find Cauchy's constants of a prism by using spectrometer.
8. To find resolving power of a telescope
9. To determine Planks constant using photocell.
10. To study the characteristics of solar cell and find out the fill factor.
11. To verify the inverse square law with the help of a photovoltaic cell.
12. To study Zeeman splitting using EPS/ ESR.

Course code	BSC-PHY-113G				
Category	Basic Science Course				
Course title	**Semiconductor Physics Lab**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
			3	**1.5**	
Branches (B. Tech.)	• Computer Science Engineering • Information Technology • Computer Science and Information Technology				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Students will be required to learn to take readings of vernier calliper, screw gauge, spherometer, spectrometer etc. during their orientation labs at the starting and **will have to perform at least ten subject related experiments in a semester.**

Basic experiments on least count and error estimation (during orientation)

- To aware about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
- Calculation of radius of curvature of a convex surface using spherometer.
- Angel measurement using spectrometer.

List of Subject related Experiments:

1. To study the forward and reverse characteristics of P-N junction diode.
2. To study the characteristics of transistor in common base configuration.
3. To study the characteristics of transistor in common emitter configuration.
4. To study the characteristics of Junction field effect (JFET) transistor.
5. To study the characteristics of Metal oxide semiconductor field effect (MOSFET) transistor.
6. To study the characteristics of Solar cell and find out the fill factor.
7. To design and study Active and Passive filters.
8. To study the reverse characteristics of Zener diode and voltage regulation using Zener Diode.
9. To determine Planks constant using photocell.
10. To measure e/m of electron using helical method.
11. To find capacitance of condenser using fleshing and quenching experiment.
12. To find temperature co-efficient of platinum using Callender Griffith bridge.
13. To find out low resistance by Carry Foster bridge.
14. To find resistance of galvanometer by post office box.
15. To compare the capacitance of two capacitors using De'Sauty Bridge.

Course code	BSC-PHY-114G				
Category	Basic Science Course				
Course title	**Mechanics Lab**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
			3	**1.5**	
Branches (B. Tech.)	• Civil Engineering • Printing Technology				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Students will be required to learn to take readings of vernier calliper, screw gauge, spherometer, spectrometer etc. during their orientation labs at the starting and **will have to perform at least ten subject related experiments in a semester.**

Basic experiments on least count and error estimation (during orientation)

- To aware about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
- Calculation of radius of curvature of a convex surface using spherometer.
- Angel measurement using spectrometer.

List of Subject related Experiments:

1. To find the moment of inertia measurement of a fly wheel.
2. To find acceleration due to gravity using bar pendulum.
3. To study resonance phenomena in mechanical oscillators.
4. To examine the behaviour of coupled pendulum.
5. To examine air track experiment and study Collisions between objects, governed by the laws of momentum and energy.
6. To find the modulus of rigidity of a wire using Maxwell's Needle.
7. To determine the moment of inertia of the given disc using Torsion pendulum.
8. To perform experiment on Rotation and Gyroscopic Precession.
9. To measure spring constant using Hook's Law.
10. To measure height of a distant object using sextant.

Course code	BSC-PHY-115G				
Category	Basic Science Course				
Course title	**Optics, Optical Fibre, Magnetism and Quantum Mechanics (OFMQ) Lab**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
			3	**1.5**	
Branches (B. Tech.)	• Bio-Technology Engineering • Textile Technology • Textile Chemistry • Fashion and Apparel Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Note: Students will be required to learn to take readings of vernier calliper, screw gauge, spherometer, spectrometer etc. during their orientation labs at the starting and **will have to perform at least ten subject related experiments in a semester.**

Basic experiments on least count and error estimation (during orientation)

- To aware about the least count of vernier calliper and screw gauge and to find the thickness of a slide using vernier calliper and diameter of wire using screw gauge.
- Calculation of radius of curvature of a convex surface using spherometer.
- Angel measurement using spectrometer.

List of Subject related Experiments:

1. To study Hall effect in semiconductors and measure the Hall coefficient.

2. To find frequency of AC mains using sonometer.

3. To study the magnetic properties of materials using B-H curve.

4. To study the Curies temperature of materials using Dielectric set up.

5. To verify the inverse square law with the help of a photovoltaic cell.

6. To determine Planks constant using photocell.

7. To study the characteristics of Solar cell and find out the fill factor.

8. To design and study Active and Passive filters.

9. To find impedance and Q factor using LCR circuit.

10. To study resonance phenomena in LCR circuit.

11. To measure e/m of electron using helical method.

12. To find temperature co-efficient of platinum using Callender Griffith bridge.

13. To study the forward and reverse characteristics of P-N junction diode.

14. To study the reverse characteristics of Zener diode and voltage regulation using Zener Diode.

Course code	BSE-CHE-101G				
Category	Basic Science Course				
Course title	**Chemistry I (Theory)**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	3	**1**	**0**	**4**	
Course Outcome	1. To analyse microscopic chemistry 2. Understand the concept of hardness of water and phenomenon of corrosion 3. Rationalise periodic properties 4. Distinguish the ranges of the electromagnetic spectrum				

Duration of Exam **3 Hrs**	Class Work 25 Marks Theory Exam 75 Marks Total 100 Marks

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-I

Atomic and molecular structure: Schrodinger equation(Introduction and concept only).. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations(derivation excluded). Molecular orbital energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene. Crystal field theory and the energy level diagrams for transition metal ions . Band structure of solids and the role of doping on band structures.

Periodic properties: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states. (12)

UNIT-II

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

Organic reactions and synthesis of a drug molecule :Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization (mechanism excluded). Synthesis of commonly used drug molecules (Asprin &Paracetamol). (10)

UNIT-III

Intermolecular forces: Ionic, dipolar and Van der Waals interactions. Equations of state of real gases and critical phenomena.

Water Chemistry and Corrosion: Hardness of water- Introduction, Types, Measurement of hardness by EDTA method, Methods of water softening (Lime soda process, Zeolite Process, Demineralisation process). Corrosion: Introduction, Types, Factor affecting corrosion and methods of prevention. (10)

UNIT-IV

Spectroscopic techniques and applications: Basic concept of spectroscopy, Principle and Applications of different spectroscopic techniques (UV-Visible and IR spectroscopy). Nuclear magnetic resonance and magnetic resonance imaging, Elementary discussion on Flame photometry. (10)

Suggested Text Books:

(i) University Chemistry, Bruce M. Mahan, Pearson Education.

(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

(iii) Essentials of Analytical Chemistry, Shobha Ramakrishnan and Banani Mukhopadhyay, Pearson Education.

(iv)Fundamentals of Molecular Spectroscopy, by C. N. Banwell

(v) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.

Krishnan

(vi) Physical Chemistry, by P. W. Atkins

(vii) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th

Edition.

Course Outcomes

The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Understand the concept of hardness of water and phenomenon of corrosion.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electron affinity.

Course code	BSC-CHE-102G				
Category	Basic Science Course				
Course title	**Chemistry I (Practical)**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester-I/II
	0	**0**	**3**	**1.5**	
Course Outcome	5. Estimate rate constants of reactions 6. Synthesize a small drug molecule 7. Measure surface tension , viscosity and conductance 8. To analyse a salt sample 9. Determine hardness and chloride content of water				

Duration of Exam **3 Hrs**	Internal Practical 25 Marks External Practical 25 Marks Total 50 Marks

Paper No. CHE-103
03 Hrs./ week

Credit: 1 ½
Max. Marks: 25+25
Duration of Exam: 03 Hrs.

LIST OF EXPERIMENTS:-

1 .Determination of surface tension of given liquid by drop number method.

2. Determine the viscosity of given liquid by using Ostwald's viscometer / Redwood viscometer.

3. Calculate the Rf value of given sample using Thin layer chromatography / Paper chromatography.

4. Removal of Ca^{2+} and Mg^{2+} hardness from given water sample using ion exchange column.

5. Determination of chloride content in given water sample.

6.Calculate the strength of strong acid by titrating it with strong base using conductometer.

7. Calculate the emf value of given cell.

8. To prepare the of urea formaldehyde and phenol formaldehyde resin.

9. To determine the rate constant of a reaction.

10. To Prepare iodoform.

11. Calculate the saponification value / acid value of given oil sample.

12. Chemical analysis of two anions and two cations in given sample of salt.

13. Determination of the partition coefficient of a substance between two immiscible liquids.

14. To determine the total hardness of given water sample by EDTA method.

15.Study the adsorption phenomena using acetic acid and charcoal.

16. Lattice structures and packing of spheres.

Course Outcomes:

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

The students will be able to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time.
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
- Synthesize a small drug molecule and analyse a salt sample.

Note: At least 10 experiments are to be performed by the students.
1.Each laboratory class/section shall not be more than about 20 students.
2.To allow fair opportunity of practical hands on experience to each student,each experiment may either done by each student individually or in groupofnotmore than 3-4 students. Larger groups be strictly discouraged/disallowed.
3.Pre-experimental &post experimentalquiz/questions may be offered for each lab experiment to reinforce &aid comprehension of the experiment.

Suggested Books:

1. A Text book on Experiments and Calculation –Engineering Chemistry by S.S.Dara, S.Chand & Company Ltd.
2. Essentials of Analytical Chemisty, Shobha Ramakrishnan, Pearson Education.
3. Essential of Experimental Engineering chemistry, Shashi Chawla, Dhanpat Rai Publishing Co.
4. Theory & Practice Applied Chemistry – O.P.Virmani, A.K. Narula (New Age).
5. Engineering Chemistry, K.Sesha Maheswaramma and Mridula Chugh, Pearson Education.

Math-I (Calculus and Matrices)
BSC-MATH-101G

Course code	BSC-MATH-101G				
Category	Basic Science Course				
Course title	Math-I (Calculus and Matrices)				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit-I

Calculus: Indeterminate forms and L'Hospital's rule, Maxima and Minima, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders, Evolutes and Involutes, Evaluation of definite and improper integrals, Applications of definite integrals to evaluate surface areas and volumes of revolutions, Beta and Gamma functions and their properties.

Unit-II

Sequences and Series: Convergence of sequence and series, Tests for convergence, Power series: Taylor's series, series for exponential, trigonometric and logarithm functions, Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit-III

Multivariable Differential Calculus: Limit, Continuity and Partial derivatives, Total derivative, Tangent plane and normal line, Maxima, minima and saddle points, Method of Lagrange multipliers, Gradient, Directional derivatives, Curl and Divergence.

Unit-IV

Matrices: Inverse and rank of a matrix, Rank-nullity theorem, System of linear equations, Symmetric, skew-symmetric and orthogonal matrices and Orthogonal transformation, Determinants, Eigenvalues and eigenvectors, Diagonalization of matrices, Cayley-Hamilton Theorem.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill Publishing Company Limited.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
5. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. P. Sivaramakrishna Das and C. Vijyakumari, Engineering Mathematics, Pearson Education.

7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course Outcomes

The students will learn:

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

Math-I (Calculus and Linear Algebra)
BSC-MATH-103G

Course code	BSC-MATH-103G				
Category	Basic Science Course				
Course title	Math-I (Calculus and Linear Algebra)				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit-I

Calculus: Indeterminate forms and L'Hospital's rule, Maxima and Minima, Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders, Evolutes and Involutes, Evaluation of definite and improper integrals, Applications of definite integrals to evaluate surface areas and volumes of revolutions, Beta and Gamma functions and their properties.

Unit-II

Matrices: Matrices, Vectors: addition and scalar multiplication, Matrix multiplication, Linear systems of equations, Linear Independence, Rank of a matrix, Determinants, Cramer's Rule, Inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Unit-III

Vector spaces I: Vector Space, Linear dependence of vectors, Basis, Dimension, Linear transformations (maps), Range and kernel of a linear map, Rank and nullity, Inverse of a linear transformation, Rank nullity theorem, Matrix associated with a linear map, Composition of linear maps.

Unit-IV

Vector spaces II: Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric and Orthogonal Matrices, Eigenbases, Diagonalization, Inner product spaces, Gram-Schmidt orthogonalization.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. D. Poole, Linear Algebra: A Modern Introduction, Brooks Cole.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. V. Krishnamurthy, V.P. Mainra and J. L. Arora, An introduction to Linear Algebra, Affiliated East–West Press Private limited.

8. Seymour Lipschutz and Marc Lipson, Linear algebra, Schaum's Outline, Tata McGraw-Hill Publishing Company Limited.
9. Kenneth Hoffman and Ray Kunze, Linear algebra, Pearson Education.

Course Outcomes

The students will learn:

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
- The essential tools of matrices and linear algebra including linear transformations, eigenvalues, diagonalization and orthogonalization.

Math-I (Series, Matrices and Calculus)
BSC-MATH-105G

Course code	BSC-MATH-105G				
Category	Basic Science Course				
Course title	Math-I (Series, Matrices and Calculus)				
Scheme and Credits	L	T	P	Credits	Semester-I
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit-I

Infinite series: Introduction of Arithmetic and Geometric Series**,** Convergence and divergence, Comparison Tests, D' Alembert's Ratio Test, Integral Test, Raabe's Test, Logarithmic and Cauchy root Tests, Gauss's test, Alternating Series, Absolute and Conditional Convergence.

Unit-II

Matrices & Its Application: Elementary Matrices, Elementary Transformations, Inverse using elementary transformations, Rank of a matrix, Normal form of a matrix, Linear dependence and independence of vectors, Consistency of linear system of equations, Linear and Orthogonal Transformations, Eigenvalues and Eigenvectors, Properties of eigenvalues, Cayley-Hamilton Theorem, Diagonalization of Matrices.

Unit-III

Differential Calculus: Limit, Continuity and Differentiability of function of single variable, Successive Differentiation, Leibnitz Theorem, Taylor's and Maclaurin's Series for Single Variable function, Partial derivatives, Homogeneous functions, Euler's Theorem, Jacobian, Maxima-Minima of function of two variables, Lagrange's Method of undetermined multipliers.

Unit-IV

Integral Calculus: Basic concepts of integration and properties of definite integrals, Applications of single integration to find volume of solids and surface area of solids of revolution, Double integral, Change of order of integration, Double integral in Polar Co-ordinates, Applications of double integral to find area enclosed by plane curves, Triple integral, Beta and Gamma functions.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill Publishing Company Limited.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.
5. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.

6. P. Sivaramakrishna Das and C. Vijyakumari, Engineering Mathematics, Pearson Education.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course Outcomes The students will learn:

- To deal with the nature of infinite series that is essential in most branches of engineering.
- The essential tool of matrices and linear algebra in a comprehensive manner
- The tools of differentiation and integration of functions of univariate and multivariate that are used in various techniques dealing engineering problems.
- The mathematical tools needed in evaluating multiple integrals and their usage.
- To apply differential and integral calculus to find volume of solids and surface area of solids of revolution. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.

Math-II (Multivariable Calculus, Differential equations and Complex Analysis)
BSC-MATH-102G

Course code	BSC-MATH-102G				
Category	Basic Science Course				
Course title	Math-II (Multivariable Calculus, Differential equations and Complex Analysis)				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit-I

Multivariable Integral Calculus: Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities), Triple integrals (Cartesian), Orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds, Scalar line integrals, Vector line integrals, Scalar surface integrals, Vector surface integrals, Theorems of Green, Gauss and Stokes.

Unit-II

Ordinary differential equations of first and higher orders: Exact, Linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Second order linear differential equations with variable coefficients, Method of variation of parameters, Cauchy-Euler equation, Power series solutions, Legendre polynomials, Bessel functions of the first kind and their properties.

Unit-III

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Finding harmonic conjugate, Elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations and their properties.

Unit-IV

Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof), Taylor's series, Zeros of analytic functions, Singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.

2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, Wiley India.
4. S. L. Ross, Differential Equations, Wiley India.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India.
6. J. W. Brown and R. V. Churchill, Complex Variables and Applications, Mc-Graw Hill.
7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
9. P. Sivaramakrishna Das and C. Vijyakumari, Engineering Mathematics, Pearson Education.
10. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.

Course Outcomes The students will learn:

- The mathematical tools needed in evaluating multiple integrals and their usage.
- The effective mathematical tools for the solutions of differential equations that model physical processes.
- The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.

Math-II (Probability and Statistics)
BSC-MATH-104G

Course code	BSC-MATH-104G				
Category	Basic Science Course				
Course title	Math-II (Probability and Statistics)				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	1		4	
Branches (B. Tech.)	• Information Technology • Computer Science Engineering • Computer Science and Information Technology				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit-I

Random variables and discrete probability distributions: Conditional probability, Probability spaces, Discrete random variables, Independent random variables, Expectation of discrete random variables, Sums of independent random variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality, The multinomial distribution, Poisson approximation to the binomial distribution, Infinite sequences of Bernoulli trials.

Unit-II

Continuous and Bivariate probability distribution: Continuous random variables and their properties, Distribution functions and densities, Normal, Exponential and Gamma densities, Bivariate distributions and their properties, Distribution of sums and quotients, Conditional densities, Bayes' rule.

Unit-III

Basic Statistics: Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions; Correlation and regression – Rank correlation; Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Unit-IV

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

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
3. S. Ross, A First Course in Probability, Pearson Education.

4. W. Feller, An Introduction to Probability Theory and its Applications, Wiley.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill Publishing Company Limited.

Course Outcomes

The students will learn:

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.

Math-II (Vector Calculus, Differential equations and Laplace Transform)
BSC-MATH-106G

Course code	BSC-MATH-106G				
Category	Basic Science Course				
Course title	Math-II (Vector Calculus, Differential equations and Laplace Transform)				
Scheme and Credits	L	T	P	Credits	Semester-II
	3	1		4	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit-I

Vector Calculus: Differentiation of vectors, Scalar and vector point functions, Gradient of a scalar field and Directional derivative, Divergence and Curl of a vector field and their physical interpretations, Integration of vectors, Line integral, Surface integral, Volume integral, Green, Stoke's and Gauss theorems (without proof) and their applications.

Unit-II

Ordinary Differential Equations: Exact differential equations, Equations reducible to exact differential equations, Applications of differential equations of first order & first degree to simple electric circuits, Newton's law of cooling, Heat flow and Orthogonal trajectories, Linear Differential equations of second and higher order, Complete solution, Complementary function and Particular integral, Method of variation of parameters to find particular integral, Cauchy's and Legendre's linear equations.

Unit-III

Laplace Transforms and its Applications: Laplace transforms of elementary functions, Properties of Laplace transforms, Existence conditions, Transforms of derivatives, Transforms of integrals, Multiplication by t^n, Division by *t*, Evaluation of integrals by Laplace transforms, Laplace transform of unit step function, Unit impulse function and Periodic function, Inverse transforms, Convolution theorem, Application to linear differential equations.

Unit-IV

Partial Differential Equations: Formation of partial differential equations, Lagrange' linear partial differential equation, First order non-linear partial differential equation, Charpit's method, Method of separation of variables.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson Education.
2. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
6. P. Sivaramakrishna Das and C. Vijyakumari, Engineering Mathematics, Pearson Education.
7. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, Wiley India.
8. S. L. Ross, Differential Equations, Wiley India.
9. R. K, Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publication House Private Limited.

Course Outcomes The students will learn:

- The mathematical tools needed in evaluating vector calculus and their usage.
- The effective mathematical tools for the solutions of differential equations that model physical processes.
- To deal with the Laplace transform and its application that is essential in most branches of engineering
- The essential tool of partial differential equation in a comprehensive manner.

BASIC ELECTRICAL ENGINEERING

Theory :	75
Class Work :	25
Total :	100
Duration of Exam :	3 Hrs.

Course Code	**ESC-EE-101G**		
Category	**Engineering Science Course**		
Course title	Basic Electrical Engineering (Theory)		
Scheme	**L**	**T**	**P**
	3	**1**	**-**

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Section A

DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws with their applications (Nodal and Mesh Analysis), analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

AC Circuits

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

Section B

Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, transformer tests regulation and efficiency. Auto-transformer and three-phase transformer connections.

Polyphase Circuits

Three phase balanced circuits, voltage and current relations in star and delta connections. Power Measurement by two wattmeter method.

Section C

Electrical Machines

Generation of rotating magnetic fields, construction, working, starting and speed control of single-phase induction motor. Construction and working of a three-phase induction motor. Construction, working, torque-speed characteristic and speed control of dc motor. Construction and working of synchronous generators.

Section D

Measuring Instruments

Construction, operating and uses of moving iron type and moving coil type, induction type voltmeter, Ammeter, watt meter, energy meter.

Electrical Installations

Components of LT Switchgear: Introduction to Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text / Reference Books

(i) E. Hughes, "Electrical and Electronics Technology", Pearson Education.
(ii) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(iii) S. K Sahdev, Basic of Electrical Engineering, Pearson Education, 2015.
(iv) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(v) L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
(vi) V. D. Toro, "Electrical Engineering Fundamentals", Pearson Education.

Course Outcomes:

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and Transformers.
- To study various type of measuring instruments.
- To introduce the components of low voltage electrical installations

BASIC ELECTRICAL ENGINEERING LABORATORY

Class Work: 25
Exam : 25
Total : 50

Course Code	**ESC-EE-102G**		
Category	**Engineering Science Course**		
Course title	Basic Electrical Engineering (Laboratory)		
Scheme	**L**	**T**	**P**
	-	**-**	**2**

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

List of Experiments:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Practical resistors, capacitors and inductors.
2. To verify KCL and KVL.
3. To verify Thevenin's and Norton theorems.
4. To verify Maximum power transfer and Superposition theorems.
5. To perform direct load test of a transformer and plot efficiency Vs load characteristic.
6. To perform O.C. and S.C. tests of a transformer.
7. Measurement of power in a 3-phase system by two wattmeter method.
8. Measurement of power by 3 voltmeter/3 Ammeter method.
9. Measuring the response of R-L, R-C, and R-L-C circuits to a step change in voltage. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
10. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
11. Torque Speed Characteristic of shunt dc motor.
12. Speed control of dc motor.

Laboratory Outcomes

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.

Course Code	**ESC-CSE-101G**			
Category	**Engineering Science Course**			
Course title	**Programming for Problem Solving**			
Scheme and Credits	**L**	**T**	**P**	**Credits**
	3	**0**	**0**	**1.5**
Pre-requisites (if any)	**-**			

Course Outcomes:

The course will enable the students:

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional ranching, iteration and recursion.
- To decompose a problem into functions
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems
- To apply programming to solve simple numerical method problems, namely differentiation of function and simple integration.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit 1

Introduction to Programming:
Idea of Algorithm: Steps to solve logical and numerical problems. Representation of
Algorithm: Flowchart/Pseudocode with examples.
C Programming: Keywords, Variables and Data Types: basic, derived and user defined, Type Conversions, Header Files, Basic Input and Output Functions and Statements, Compilation, Syntax and Logical Errors in compilation, Object and Executable Code, Storage Classes, Arithmetic Expressions and Precedence**.**

Unit 2

Preprocessors, Conditional and Branching Statements, Loops/ Iterative Statements**,** Writing and evaluation of conditionals and consequent branching.

Unit 3

Arrays (1-D, 2-D), Character Arrays and Strings, Arrays with Pointers, Functions (including using built in libraries), Parameter passing in functions, Call by Value, Call by Reference, Passing arrays to functions, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Unit 4

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, Introduction to Dynamic Memory Allocation and its Methods, Structures, Union, Defining Structures and Array of Structures, File Handling.

Suggested Text Books:

Ajay Mittal, Programming in C, 'A Practical Approach', Pearson Education.

Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Yashavant Kanetkar, Let Us C, BPB Publication.

Suggested Reference Books

Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Code	**ESC-CSE-103G**			
Category	**Engineering Science Course**			
Course title	**Programming in C Lab**			
Scheme and Credits	**L**	**T**	**P**	**Credits**
	0	**0**	**4**	**2**
Pre-requisites (if any)	**-**			
Remarks	The lab component should have one hour of tutorial followed or preceded by laboratory assignments.			

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations: To be able to create, read and write to and from simple text files.

Course Code	**ESC-CSE-102G**			
Category	**Engineering Science Course**			
Course title	**Programming for Problem Solving**			
Scheme and Credits	**L**	**T**	**P**	**Credits**
	3	**0**	**0**	**1.5**
Pre-requisites (if any)	**-**			

Course Outcomes:

The course will enable the students:

- To learn various number systems
- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional ranching, iteration and recursion.
- To decompose a problem into functions
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Unit 1

Introduction to computers and its functional units, Number System: Binary, Octal, Decimal, Hexadecimal and their inter conversion methods. Operations on number systems: Addition, Subtraction, Complement etc.

Unit 2

Introduction to Programming: Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

C Programming: Keywords, variables, data types, header files, basic input and output functions and statements, Compilation, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence**.**

Unit 3

Conditional statements, branching and Loops**,** Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Unit 4

Arrays (1-D, 2-D), Character arrays and Strings, Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference. Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Suggested Text Books:

Ajay Mittal, Programming in C, ‘A Practical Approach’, Pearson Education.

Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Yashavant Kanetkar, Let Us C, BPB Publication.

Suggested Reference Books

Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Pearson Education.

Course Code	**ESC-CSE-104G**			
Category	**Engineering Science Course**			
Course title	**Programming in C Lab**			
Scheme and Credits	**L**	**T**	**P**	**Credits**
	0	**0**	**4**	**2**
Pre-requisites (if any)	**-**			
Remarks	The lab component should have one hour of tutorial followed or preceded by laboratory assignments.			

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Course Code	**ESC-ME-102G**				
Category	**ENGINEERING SCIENCE COURSE**				
Course Title	**WORKSHOP TECHNOLOGY**				
Scheme and Credits	**L**	**T**	**P**	**CREDITS**	**Semester-I /II**
	1	**0**	**0**	**1**	
Pre-Requisites(if any)					
Theory-75 Marks	**Internal Assessment-25 Marks**		**Total-100 Marks**		**Duration of Exam-3 Hrs**

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT-1

Manufacturing Processes:

Introduction to Manufacturing Processes and their Classification, , additive manufacturing Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accident, Methods of Safety, First Aid, Objectives of Layout, Types of Plant Layout and their Advantages.

UNIT-II

Carpentry, Fitting & Forming Processes

Basic Principle of Hot & Cold Working, Hot & Cold Working Processes, Rolling, Extrusion, Forging, Drawing, Wire Drawing and Spinning, Sheet Metal Operations: Measuring Layout marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining. Advantages of timber, types of timber, defects in timber, carpentry tools, classification of metals, fitting tools, fitting operations, glass cutting

UNIT-III

Casting and Machine Tools

Introduction to Casting Processes, Basic Steps in Casting Processes, Pattern: Types of Pattern and Allowances, Sand Casting: Sand Properties, Constituents and Preparation. Gating System. Melting of Metal, Cupola Furnace, Casting Defects & Remedies, plastic moulding, lathe machine, lathe operations, CNC machining, Shaper and planner machine.

UNIT-1V

Welding :

Introduction to welding, Classification of Welding Processes, GAS Welding : Oxy-Acetylene Welding, Resistance Welding : Spot and Seam Welding, Arc Welding : Metal Arc, TIG & MIG, Welding Defects and Remedies, Soldering & Brazing.

Suggested Text/Reference Books:

(i) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 7th Edition, Pearson Education, 2018.
(ii) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of

Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(iii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Processes for Engineering Materials, Pearson Education.
(iv) Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008.
(v) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Pearson Education.
(vi) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House,

Course Outcomes

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials

Course Code	**ESC-ME-103G**				
Category	**ENGINEERING SCIENCE COURSE**				
Course Title	**MANUFACTURING PRACTICES**				
Scheme and Credits	**L**	**T**	**P**	**CREDITS**	**Semester-I /II**
	0	**0**	**4**	**2**	
Pre-Requisites(if any)					
External Practical-25 Marks	**Internal Practical-25 Marks**		**Total-50 Marks**	**Duration of Exam-3 Hrs**	

List of Experiments/ Jobs

1. To study different types of measuring tools used in metrology and determine least counts of vernier calipers, micrometers and vernier height gauges.
2. To study different types of machine tools (lathe, shaper, planer, milling, drilling machines)
3. To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.
4. To study different types of fitting tools and marking tools used in fitting practice.
5. To prepare lay out on a metal sheet by making and prepare rectangular tray pipe shaped components e.g. funnel.
6. To prepare joints for welding suitable for butt welding and lap welding.
7. To study plastic moulding and glass cutting process
8. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
9. To prepare simple engineering components/shapes by forging.
10. To prepare mold and core assembly.
11. To prepare horizontal surface/vertical surface/curved surface/slats or V-grooves on a shaper/planner.
12. To prepare a job involving side and face milling on a milling
13. To study electric machines, electronic components and power tools.

Note :

At least ten experiments/jobs are to be performed/prepared by the students in the semester.

Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

Course Code	**ESC-ME- 101G**				
Category	**ENGINEERING SCIENCE COURSE**				
Course Title	**ENGINEERING GRAPHICS & DESIGN**				
Scheme and Credits	**L**	**T**	**P**	**CREDITS**	**Semester-I /II**
	1	**0**	**4**	**3**	
Pre-Requisites(if any)					
External Practical-75 Marks	**Internal Practical/Class Marks-25 Marks**		**Total-100 Marks**	**Duration of Exam-3 Hrs**	

UNIT-I

Module 1: Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Module 2: Orthographic Projections

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

UNIT-II

Module 3: Projections of Regular Solids

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

Module 4: Sections and Sectional Views of Right Angular Solids

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

Module 5: Isometric Projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

UNIT-III

Module 6: Overview of Computer Graphics

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]

UNIT-IV

Module 7: Annotations, layering & other functions

Applying dimensions to objects, applying annotations to drawings; layers to create drawings, orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies.

Drawing of Engineering objects like coupling, crankshaft, pulley.

Module 8: Demonstration of a simple team design project that illustrates

Geometry and topology of engineered components, Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Suggested Text/Reference Books:

(i) Shah, M.B. & Rana B.C., Engineering Drawing, Pearson Education
(ii)Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
(iii) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
(iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
(v) (Corresponding set of) CAD Software Theory and User Manuals

Course Outcomes

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for

Engineering practice The student will learn :

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling

Course Code : HSMC-ENG-101G
Category : Humanities
Course Title : English Language Skills

L	T	P	Credits			
2	0	0	2			

Internal Assessment	**:**	**25 Marks**
ExternalAssessment	**:**	**75 Marks**
Total	**:**	**100 Marks**
Duration of Exam	**:**	**03 Hours**

Course Objective:
To equip the students with English language skills needed in academic and professional world and to inculcate human/ethical values in them
Course Outcome:
The students will acquire basic proficiency in English with special emphasis on reading and writing skills, and writing practices along with an inclination to become better human beings.
Course Contents:

Section: A
Basic Writing skills

Subject Verb Agreement, Noun Pronoun Agreement, Governance of Nouns through Prepositions, Basic Verb Patterns (V, SV, SVO, SVOO, SVC, SVOC, SVOA)

Section: B
Vocabulary Building& Creating Grammatical Cohesion

One word substitution, Phrasal Verbs,Commonly used Idioms, Foreign words, Referring Time in Language (Tenses), Use of Active and Passive Voice

Section: C
Phonetics
Basic concept –Vowels, Consonants, Phonemes, Syllable, Transcription of words

Section: D
Reading and Writing Practices

(a)Literary Texts:

i. “Patriotism beyond politics and Religion’ by Abdul Kalam Azad
ii. “The Secret of Work” by Swami Vivekananda
iii. “An Outline of Intellectual Rubbish” by Bertrand Russell
iv. “Mother Teresa” by Khushwant Singh

(b) Writing official Letters- Issues Concerning Students’ academic and social life
(c) Essay Writing
(d) Paragraph Writing

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

Recommended Readings:

1. Nitin Bhatnagar and Mamta Bhatnagar, *Communicative English for Engineers and Professionals*. Pearson Education.

2.Bhatnagar, k. Manmohan.Ed. *The Spectrum of Life: An Anthology of Modern Prose*. Delhi: Macmillan India Ltd., 2006.

3 C. Murlikrishna& Sunita Mishra, Communication Skills for Engineers, Pearson Ed.

4 Sinha, R.P.*Current English Grammar and Usage*. OUP.

5.Rizvi, M. Ashraf.*Effective Technical Communication*. McGraw Hill Education (India) Pvt. Ltd., 2014.

6.Eastwood, John.*Oxford Guide to English Grammar*.OUP, 2010.

7.Kumar, Sanjay and PushpLata. *Communication Skills*. OUP, 2011.

8. Raman, Meenakshi and Sangeeta Sharma.*CommunicationSkills*.NewDelhi:OUP,2011.

9.Hill, L.A.*A Guide to Correct English*.London:OUP,1965.

10.*Oxford Dictionary of English Idioms*. New Delhi: OUP, 2009

11*http://yousigma.com/religionandphilosophy/swamivivekananda/thescecretofwork.pdf

Course Code : HSMC-ENG-102 G
Category : Humanities
Course Title : English Language Lab

L	T	P	Credit/s			
0	0	2	1	Internal Assessment	:	25 Marks
				ExternalAssessment	:	25 Marks
				Total	:	50 Marks
				Duration of Exam	:	03 Hours

Course Objective:
The course aims at developing the desired English language skills of students of Engineering and Technology so that they become proficient in communication to excel in their professional lives. The course has been sodesigned as to enhance their linguistic and communicative competence.

Course Outcome:
The students will acquire basic proficiency in English with special emphasis on listening, comprehension and speaking skills both at social and professional platforms.

Course Contents:

(i) Listening comprehension
(ii) Recognition of phonemes in International Phonetic Alphabet
(iii) Self introduction and introduction of another person
(iv)Conversation and dialogues in common everyday situations
(v) Communication at work place (Standard phrases and sentences in various situations)
(vi)Telephonic communication
(vii) Speeches for special occasions (Welcome speeches, Introduction speeches, Felicitation
speeches and Farewell speeches)
(viii) Tag Questions
(ix)Formal Presentations on literary texts prescribed in theory paper

Note: Three hour time to each segment is recommended for instruction and practice.

Scheme of End Semester Practical Exam:

1. A small passage may be read out to the examinees and they will have to write the answers to the questions asked at the end of the passage.Questions will be short answertype.
2. Examinees may be asked to identify the sounds of phonemes in given words.
3. Examinees may be asked to introduce themselves or others, participate in role play activities in mock situations, give short responses, engage in hypothetical telephonic conversation or supply the tag questions to statements etc.
4. Examinees may also be asked to deliver speeches on given situations or make presentation on the literary texts prescribed in Unit IV of theory paper.

Recommended Readings:

1. Bhatnagar, Nitin andMamta Bhatnagar.*Communicative English for Engineers and Professionals*.Pearson Education, 2013.
2. Swan, Michael.*Practical English Usage*. OUP, 1995.
3. Gangal, J.K. *Practical Course in Spoken English*. New Delhi: PHI Learning, 2015.

4. Konar,Nira. *Communication Skills for Professionals*. New Delhi: PHI Learning Pvt. Ltd., 2009.
5. Bansal, R.K. and J.B. Harrison. *Spoken English*. Orient Longman, 1983.
6. Sharma, Sangeeta and Binod Mishra. *Communication Skills for Engineers and Scientists*. Delhi: PHI Learning Pvt. Ltd., 2015.

M.D. UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION

B.TECH. (CIVIL ENGINEERING)

SEMESTER 3rd and 4th

Scheme effective from 2019-20

COURSE CODE ANDDEFINITIONS

Course Code	Definition
L	Lecture
T	Tutorial
P	Practical
BSC	Basic ScienceCourses
ESC	EngineeringScienceCourses
HSMC	Humanities and Social Sciences includingManagementcourses
PCC	Professional Core Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION

Bachelor of Technology (Civil Engineering) Scheme effective from 2019-20

SEMESTER 3rd

Sr. No.	Course Code	Course Title	Hours per week	Contact hours per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L-T-P			Class work	Theory	Practical	Total	
1.	HSMC-201-G	Economics For Engineers	2-0-0	2	2	25	75	-	100	3
2.	PCC-201-G	Introduction to Civil Engineering	2-0-0	2	2	25	75	-	100	3
3.	BSC-Math-205-G	Mathematics III	2-1-0	3	3	25	75	-	100	3
4.	PCC-203-G	Engineering Mechanics	3-1-0	4	4	25	75	-	100	3
5.	*MC-106-G	Environmental Science	3-0-1	4	0	25	75	-	--	3
6.	PCC-CE-205-G	Fluid Mechanics	2-1-0	3	3	25	75	-	100	3
7.	PCC-CE-207-G	Surveying	2-1-0	3	3	25	75	-	100	3
8.	LC-CE-209-G	Building Drawing lab	0-0-2	2	1	25	-	25	50	3
9.	LC-CE-211-G	Engineering Mechanics Lab.	0-0-2	2	1	25	-	25	50	3
10.	LC-CE-213-G	Fluid Mechanics Lab.	0-0-2	2	1	25	-	25	50	3
11.	LC-CE-215-G	Surveying Lab.	0-0-2	2	1	25	-	25	50	3
TOTAL					**21**					

MC-106Gis a mandatory non –credit course in which the students will be required passing marks in theory.

Course Name	**:**	**ECONOMICS FOR ENGINEERS**	
Course Code	**:**	**HSMC-201-G**	**External marks: 75**
Credits	**:**	**2**	**Internal marks: 25**
L-T-P	**:**	**2-0-0**	**Total marks: 100**

Course Objectives:

1. Acquaint the students to basic concepts of economics and their operational significance.
2. To stimulate the students to think systematically and objectively about contemporary economic problems

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

SYLLABUS

UNIT-1

Definition of Economics- Various definitions, types of economics- Micro and Macro Economics, nature of economic problem, Production Possibility Curve, Economic laws and their nature, Relationship between Science, Engineering, Technology and Economic Development.

Demand- Meaning of Demand, Law of Demand, **Elasticity of Demand**- meaning, factors effecting it, its practical application and importance.

UNIT-2

Production- Meaning of Production and factors of production, Law of variable proportions, Returns to scale, Internal and external economies and diseconomies of scale.

Various concepts of cost of production- Fixed cost, Variable cost, Money cost, Real cost, Accounting cost, Marginal cost, Opportunity cost. Shape of Average cost, Marginal cost, Total cost etc. in short run and long run.

UNIT-3

Market- Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).

Supply- Supply and law of supply, Role of demand & supply in price determination and effect of changes in demand and supply on prices.

UNIT-4

Indian Economy- Nature and characteristics of Indian economy as under developed, developing and mixed economy (brief and elementary introduction), **Privatization** - meaning, merits and demerits.

Globalization of Indian economy - merits and demerits.

Banking- Concept of a Bank, Commercial Bank- functions, Central Bank- functions, Difference between Commercial & Central Bank.

Course Outcomes: By the end of this course the student will be able to:

1. The students will able to understand the basic concept of economics.
2. The student will able to understand the concept of production and cost.
3. The student will able to understand the concept of market.
4. The student will able to understand the concept of privatization, globalization and
5. banks.

Suggested Books:

1. Jain T.R., Economics for Engineers, VK Publication.
2. Chopra P. N., Principle of Economics, Kalyani Publishers.
3. Dewett K. K., Modern economic theory, S. Chand.
4. H. L. Ahuja., Modern economic theory, S. Chand.
5. Dutt Rudar & Sundhram K. P. M., Indian Economy.
6. Mishra S. K., Modern Micro Economics, Pragati Publications.
7. Singh Jaswinder, Managerial Economics, dreamtech press.
8. A Text Book of Economic Theory Stonier and Hague (Longman's Landon).
9. Micro Economic Theory – M.L. Jhingan (S.Chand).
10. Micro Economic Theory - H.L. Ahuja (S.Chand).
11. Modern Micro Economics : S.K. Mishra (Pragati Publications).
12. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co).

INTRODUCTION TO CIVIL ENGINEERING			
Course Code	**PCC-201-G**	**External marks:**	**75**
Credits	**2**	**Internal marks:**	**25**
L-T-P	**2-0-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To provide the students an overview of the profession of Civil Engineering.
- To give the students an illustration of the Civil Engineering, properties of various building material, basic requirements of a building and explain the building construction aspects.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION-A

Module 1: Civil Engineering and Society

Basics of Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Early constructions and developments over time; Ancient monuments & Modern marvels, Works of Eminent civil engineers, Impact (social, economic, environmental) of Civil Engineering on Society, Introduction to green building concept and methods, Job opportunities in Civil Engineering.

Module 2: Masonry Construction

Introduction, Various terms used in brick masonry, classification of bricks, composition, bonds in brick work, laying brick work, structural brick work, reinforced brick work, Defects in brick masonry, Stone masonry and its classification, composite masonry, Glass block masonry.

SECTION-B

Module 3: Stones and Tiles

Stones: Classification, requirements of good structural stone, quarrying, blasting, dressing of stones, prevention and seasoning of stone; **Tiles:** Manufacturing of tiles, Terra-cotta and its types, uses of terracotta.

Module 4: Timber, paints and varnishes

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, advantages of plywood and fiber boards, Important Indian timbers; Basic constituents of paints, types of paints, constituents of varnishes, characteristics and types of varnishes.

SECTION-C

Module 5: Roofs and Floors

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings. Doors and Windows: Locations, sizes, types of doors and windows, fixtures and fasteners for doors and windows.

Module 6: Cavity, Partition Walls and Foundations

Cavity walls and its position, advantages of cavity wall, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall. Types of foundations, sub-surface investigation, Foundation in water logged areas, Masonry wall foundation, Introduction to deep foundations.

SECTION-D

Module 7: Damp-Proofing, Water-Proofing and Fire protection

Dampness and its causes, prevention of dampness, materials used, amp-proofing treatment in buildings; Water proofing: water- proofing treatment of roofs; Fire protection: Fire resisting construction, fire protection requirements for buildings.

Module 8: Sound insulation and Acoustics

Classification, measurement and transmission of sound, sound insulation of buildings, Acoustical materials and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses.

COURSE OUTCOMES:

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

- Explain the importance of Civil Engineering in the infrastructural development of the society.
- They will be able to illustrate the types and properties of various building materials.
- To be aware of various traditional building materials and also the emerging materials in the field of Civil Engineering construction.
- To select suitable type of flooring, Plastering, varnishes with their application.
- They should be able to describe the basic requirements to construct a building.

Suggested Books:

- Building Construction By Sushil Kumar, Standard Pub., N. Delhi
- Building Material By Rangawala
- Construction Engineering By Y.S. Sane
- Building Construction By Gurcharan Singh, Standard Pub., N. Delhi

Course Name	**:**	**Mathematics III**	
Course Code	**:**	**BSC-MATH-205-G**	**External marks: 75**
Credits	**:**	**3**	**Internal marks: 25**
L-T-P	**:**	**2-1-0**	**Total marks: 100**
Course Objectives:			

Course Objectives:

At the end of this course, the student should be able to learn the behaviour of civil engineering determinate structures under static and moving loads by analytical/experimental techniques and software tools. The student should also be able to acquire the ability to interpret and evaluate experimental results.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

SYLLABUS

Unit-I

Partial Differential equations: First order linear partial differential equations, First order non-linear partial differential equations, Charpit's method, Second order linear partial differential equations and their classifications, Method of separation of variables and its applications to wave equation, One dimensional heat equations and Two dimensional heat flow (steady state solutions only)

Unit-II

Numerical methods: Solution of Polynomial and Transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson method, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae, Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules

Unit-III

Transform Calculus: Laplace Transform, Properties of Laplace transform, Laplace transform of periodic functions, Inverse Laplace transform by different methods, Convolution theorem, Evaluation of integrals by Laplace transform, Solving ordinary differential equations by Laplace transform method

Unit-IV

Discrete Maths: Pigeon-hole principle, Permutation, Combination, Algebraic structures with one binary operation- Semi group, Monoid and Group, Cosets, Lagrange's theorem, Cyclic group, Normal subgroup

Course Outcomes: By the end of this course the student will be able to:

1. To solve field problems in engineering involving partial differential equations
2. To find roots of polynomial and transcendental equations using numerical methods and conduct numerical integration
3. To deal with the Laplace transform and its application
4. To classify algebraic structure of any mathematical problem.

Suggested Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers
4. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand and Company
5. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI.
6. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
7. C. L. Liu, Elements of Discrete Mathematics, Tata McGraw-Hill.
8. K. H. Rosen, Discrete Mathematics and its Applications, Tata McGraw-Hill.
9. J. L. Hein, Discrete Structures, Logic and Computability, Jones and Bartlett.

ENGINEERING MECHANICS			
Course Code	**PCC-203-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- Students should be able to identify and analyse the basic structural elements.
- Students can apply the concepts of analysis for the design of various civil engineering structures.
- Covers the relationship between stress and strain on deformable solids, principal stresses, maximum shearing stress, and the stresses acting on a structural member.
- To provide basic knowledge in mechanics of materials so that the students can solve real engineering problems and design engineering systems.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION-A

Module 1: Simple Stresses and Strains

Properties of Materials, i.e. tensile test, idealized stress- strain diagrams, isotropic, linear, elastic, Visco- elastic and plastic materials, Concept of stresses and strains, St.Venant's principle, relationship between elastic constants, Poisson's Ratio, Hoop stress, Stress and extension of uniform bar and tapered bar under its own weight and due to load, stresses produced in compound bars due to axial loads, Factor of Safety, Thermal stress and strain calculations, Shear stresses and shear strain, Complementary shear stress.

Module 2: Compound stress and strains

Normal stress, tangential Stresses, Stresses induced due to Uniaxial loads, stresses induced by state of simple shear, stresses induced due to biaxial loads, Mohr's Circle (Graphical Method), Principal stresses and principal planes, Maximum shear stresses, Proof stress.

SECTION-B

Module 3: Shear Force and Bending Moment in Beams and Frames

Type of loads, Shear force and bending moment, relation between Shear force and bending moment, Definition and Sign conventions, axial force, Shear force and Bending moment diagrams

Module 4: Bending stresses and Shear stresses in Beam

Pure bending, bending stresses, combined bending and direct stresses, Middle Third rule, composite beams, Variation of shear stresses for various cross-sections of a beam.

SECTION-C

Module 5: Torsion and Thin Cylinder

Torsion equation, its applications to the hollow and solid circular shafts, comparison of solid and hollow Shafts, shafts in series and parallel. Combined torsion and bending of circular shafts. Introduction to thin cylinder, Stresses in thin cylinder vessels subjected to internal pressure Circumferential stresses (Hoop Stresses), longitudinal stress.

Module 6: Column and Strut

Criteria for stability of columns, Buckling of columns, Euler's formula for various end restraints, Rankine's formula, eccentrically loaded struts, struts with initial curvature, struts with lateral loading.

SECTION-D

Module 7: Analysis of Plane Trusses

Different types of trusses, Analysis of plane determinate trusses by method of joints, method of sections and analysis of Space Trusses using Tension Coefficient Method.

Module 8: Failure Theories

Theories of failure: maximum principal stress theory, maximum principal strain theory, maximum shear stress theory, maximum strain energy theory, distortion energy theory, comparison of the failure theories.

Course Outcomes:

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

- Identify different materials and their behaviour.
- Analyse various civil engineering structures under different loading conditions.
- Apply the principles of structural mechanics in design structural elements.
- Apply the concepts of failure theories for design of structures.

Suggested Books:

- Strength of Material by G.H. Ryder, MacMillan Publishers India Ltd.
- Mechanics of Materials by E.J. Hearn, Elsevier Publications.
- Mechanics of Materials by Punmia and Jain, Laxmi Publications (P) Ltd.
- Mechanics of Materials by R.C.Hibbeler, Pearson Higher Education.
- Strength of Materials by Timoshenko and Young,, East West Press.
- Mechanics of materials by V Gupta, Narosa publishing house.

ENVIRONMENTAL SCIENCE, *MC-106-G

Objective: To provide the basic knowledge in Environmental Sciences to students of Engineering. It will guide the students living in a historic transitional period of burgeoning awareness of the conflict between human activities and environmental constraints to help and save the fragile and endangered planet with the natural resources already overexploited.

Course code: MC-GES-106-G

Environmental Studies (Semester 1)							
Lecture	Tutorial	Practical/Field visit	Credit	Theory	Field visit	Total	Time
3	0	1	-	75	25	-	3Hrs

MC-ENV : (ENVIRONMENTAL SCIENCE)

Theory 75 Marks Field Work 25 Marks (Practical/Field visit)

Unit-1 The Multidisciplinary nature of environmental studies. Definition, scope and importance. (2 lecture)

Unit-2 Natural Resources :

Renewable and non-renewable resources : Natural resources and associated problems.

a) Forest resources : Use and over-exploitation : deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Water logging, salinity, case studies.

e) Energy resources : Growing energy needs; renewable and non- renewable energy sources, use of alternate energy sources, case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

* Role of an individual in conservation of natural resources.

* Equitable use of resources for sustainable lifestyles.

(8 lectures)

Unit-3 Ecosystems :

* Producers, consumers and decomposers.
* Energy flow in the ecosystem.
* Ecological succession.
* Food chains, food webs and ecological pyramids.
* Introduction, types, characteristic features, structure and function of the following ecosystem :

a. Forest ecosystem.

b. Grassland ecosystem. c. Desert ecosystem.

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
(6 lectures)

Unit-4 Biodiversity and its conservation

* Introduction - Definition : Genetic, Species and ecosystem diversity.
* Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
* Biodiversity at global, National and local levels.
* India as a mega-diversity nation.
* Hot-spots of biodiversity.
* Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
* Endangered and endemic species of India.
* Conservation of biodiversity : In-situ and ex-situ conservation of biodiversity.

(8 lectures)

Unit-5 Environmental pollution :

Definition, causes, effects and control measures of :

a) Air pollution.

b) Water pollution c) Soil pollution

d) Marine pollution e) Noise pollution

f) Thermal pollution g) Nuclear hazards

* Solids waste management: causes, effects and control measures of urban and industrial wastes.
* Role of an individual in prevention of pollution.
* Pollution case studies.
* Disaster management : floods, earthquake, cyclone and landslides.

(8 lectures)

Unit-6 Social issues and the Environment:

- From unsustainable to sustainable development.

- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people : its problems and concerns case studies.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of pollution) Act.
- Water (Prevention and Control of pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- * Public awareness. (7 lectures)

Unit-7 Human population and the Environment.

Population growth, variation among nations. Population explosion- Family Welfare Programme. Environment and human health.

Human Rights. Value Education. HIV/AIDS.

Woman and Child Welfare

Role of Information Technology in Environment and human health.

Case Studies. (6 lectures)

Unit-8 Field Work :

* Visit to a local area to document environmental assets - river/forest/grassland/hill/mountain.
* Visit to a local polluted site-urban/Rural/ Industrial/ Agricultural.
* Study of common plants, insects, birds.
* Study of simple ecosystems- pond, river, hill slopes, etc. (Field work equal to 10 lecture hours).

References

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2. Bharucha, Frach, The Biodiversity of India, MApin Publishing Pvt. Ltd. Ahmedabad-380013, India, E-mail : mapin@icenet.net (R).
3. Brunner R.C. 1989, Hazardous Waste Incineration, Mc. Graw Hill Inc. 480p.
4. Clark R.S., Marine pollution, Slanderson Press Oxford (TB).
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. House, Mumbai 1196 p.
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R).
8. Gleick, H.P., 1993. Water in crisis, Pacific Institute for Studies in Dev. Environment & Security Stockholm Env. Institute, Oxford Univ. Press, 473p.
9. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge Uni. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.
12. Mackinney, M.L. & Schoch, RM 1996, Environmental Science systems & solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Mayyer Hazardous, Tekchno-Science Publications (TB).
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB).
15. Odum, E.P. 1971, Fundamentals of Ecology. W.B. Saunders Co. USA, 574p.
16. Rao M.N. & Datta, A.K. 1987 Waste Water Treatment. Oxford & TBH Publ. Co. Pvt. Ltd. 345p.
17. Sharma, B.K. 2001, Environmental Chemistry, Goal Publ. House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C., Harper J. and Michael Begon. Essentials of Ecology, Blackwell Science (TB).
20. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Comliances and Standards, Vol. I and II Enviro Media (R).
21. Tridevi R.K. and P.K. Goal, Introduction to air pollution, Techno Science Publications (TR).

22. Wagner K.D., 1998, Environmental Management, W.B. Saunders co. Philadelphia, USA 499p.

23. A text book environmental education G.V.S. Publishers by Dr. J.P. Yadav.

(M) Magazine (R) Reference (TB) Textbook

The scheme of the paper will be under :

The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded.

The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations.

Exam. Pattern : In case of awarding the marks, the paper will carry 100 marks. Theory : 75 marks, Practical/ Field visit : 25 marks.
The structure of the question paper will be :

Part- A : Short Answer Pattern	:	15 marks
Part- B : Essay Type with inbuilt choice	:	60 marks
Part-C : Field Work (Practical)	:	25 marks

Instructions for Examiners :

Part- A : Question No. 1 is compulsory and will contain five short- answer type question of 3 marks each covering the entire syllabus.

Part-B : Eight essay type questions (with inbuilt choice) will be set from the entire syllabus and the candidate will be required to answer any four of them. Each essay type question will be of 15 marks.

The examination of the regular students will be conducted by the concerned college/Institute. Each student will be required to score minimum 40% marks separately in theory and practical/Field visit. The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students.

Fluid Mechanics			
Course Code	**PCC-CE-205-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- Introduce the concepts of fluid mechanics useful in Civil Engineering applications.
- To provide the students a first level exposure related to fluid statics, kinematics and dynamics.
- To provide the knowledge for measurement of pressure, computations of hydrostatic forces on structural components, concepts of Buoyancy and their applications in many engineering problems.
- Topics included in this course are aimed to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology in later semesters.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION A

Module 1: Basic Concepts and Definitions

Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, cavitations; surface tension, capillarity, Bulk modulus of elasticity, compressibility, types of fluids

SECTION B

Module 2: Fluid Statics

Fluid Pressure: Pressure density height relationship, pressure at a point, Pascal's law, gauge and absolute pressure, Pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, pressure gauges,

Module 3: Hydrostatic pressure and force

Hydrostatic pressure and force: horizontal, vertical and inclined surfaces, centre of pressure. Buoyancy and stability of floating bodies, metacentric height

SECTION C

Module 4: Fluid Kinematics

Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; rotation and circulation; Stream line, path line, streak line and stream tube; stream function, velocity

potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

Module 5: Fluid Dynamics
Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; limitations of Bernoulli's equation, Practical applications of Bernoulli's equation: Venturimeter, Orifice meter and Pitot tube

SECTION D

Module 6: Boundary Layer Analysis
Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries, Local and average friction coefficients Separation and Control.

Module 7: Dimensional Analysis and Hydraulic Similitude
Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modelling, similar and distorted models.

COURSE OUTCOMES:

- Understand the broad principles of fluid statics, kinematics and dynamics
- Understand definitions of the basic terms used in fluid mechanics
- Understand classifications of fluid flow
- Be able to apply the continuity, momentum and energy principles
- Be able to apply dimensional analysis

SUGGESTED BOOKS:

- Hydraulic and Fluid Mechanic by P.N.Modi & S.M.Seth
- Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald 3 Fluid Mechanics Through Problems by R.J.Garde
- Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker
- Fluid Mechanic and Hydraulic machines R.K. BANSAL

Surveying			
Course Code	**PCC-CE-207-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To understand the importance of surveying in Civil engineering.
- To study the basics of linear, angular and direction measurements using chain/tape, theodolite and compass.
- To study the method of determination of height of points using various levelling method and tacheometer.
- To study the significance of Plane Table surveying in preparation of map and setting of different types of curves.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION A

Module 1: Basics of Surveying and Linear measurement

Definition, principles of surveying, objectives and classifications, Instruments used for measuring distance, chaining, errors in chaining, tape corrections and examples, concept of Geoids and reference spheroids.

Module 2: Direction Measurement

Types of compass- prismatic and surveyor's compass, Bearings and meridians, declination, local attraction, errors and adjustments, Methods of compass traversing, checks in traversing, adjustment of closed traverse and examples.

SECTION B

Module 3: Levelling

Terms used in levelling, types of levels and staff, principles of levelling, temporary adjustments of levels, reduction of levels and booking of staff readings, examples.

Module 4: Geodetic Trigonometric levelling

Height and distances- base of the object accessible and inaccessible, geodetical observation, correction due to curvature and refraction, axis signal correction, difference in elevation between two points.

SECTION C

Module 5: Plane Table Surveying

Plane table accessories, methods of plane table surveying, sources of error, advantages and disadvantages of plane table surveying; contouring and characteristics of contour lines, locating contours, interpolation of contours, contour maps.

Module 6: Angle Measurement

Theodolite, parts of theodolite, Temporary adjustment of Theodolite, measurement of horizontal and vertical angles by different methods, theodolite traversing, adjustments of closed traverse.

SECTION D

Module 7: Tachometric surveying

Principle of of tacheometric surveying, different instrument used in tacheometry, stadia and tangential method of tacheometry, tacheometric constants and their determinations, examples.

Module 8: Curves

Classification of curves, elements of simple circular curve, location of tangent points- chain and tape methods, instrumental methods, Examples; types of transition curves; Vertical Curves: Necessity and types of vertical curves, setting out of a vertical curve by tangent correction, chord gradient and sight distance method.

COURSE OUTCOMES:

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

- To carry out surveying in the field for various civil engineering projects, prepare a contour map and plan of the area.
- Taking accurate measurements with different surveying instruments.
- Adjustment of traverse, and understand the process of setting of different curves for road and railway designs.

SUGGESTED BOOKS:

- Surveying volume I and II: B C Punmia.
- Engineering Surveying (Sixth Edition): W. Schofield.
- Text Book of Surveying: C. Venkataramiah.
- Introduction to GPS: The Global Positioning System: Ahmed El-Rabbany.
- Various Online resources including NPTEL.

Building Drawing Lab.			
Course Code	**LC-CE-209-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To understand the principles of planning and bylaws.
- To draw plan, elevation and section of bond in brick work, walls and foundations, load bearing and framed structures.
- To prepare detailed working drawing for different parts of a building.

COURSE CONTENT

LIST OF EXPERIMENTS

1. Cavity Wall.
2. Different Bonds in brick work.
3. Grillage foundation.
4. Preparation of building drawing mentioning its salient features including the following details: a) Ground floor plan b) Two Sectional Elevations c) Front and Side Elevations
5. Plan and Sectional Elevation of different Stair-Cases.
6. Plan and Sectional Elevation of different Doors and Windows.
7. Plan and Sectional Elevation of different Ventilators.
8. Plan and Sectional Elevation of Floors.
9. Plan and Sectional Elevation of different roofs.

Course Outcomes:

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

- Student's ability to perform basic sketching techniques will improve.
- Students will be able to draw orthographic projections and sections.
- Student's ability to use architectural and engineering scales will increase.
- To prepare drawings for doors, windows, floors etc.
- To use various Symbols, Conventions and Abbreviations for building drawing,
- Prepare detail planning for single and two storied residential building and public building.

ENGINEERING MECHANICS LAB			
Course Code	**LC-CE-211-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-1**	**Total marks:**	**50**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- Structural Analysis experiments help to understand, to know the practical behaviour of the physical structures like beams, roof truss etc.
- A proper structural analysis of these structures helps the students to solve the practical problems.
- Different structural apparatus like Simply Supported Beam, Curved Member of different shape, Pin Joint Truss are studied in the laboratory.

LIST OF EXPERIMENTS

1. To determine elastic properties of a beam.
2. Torsion of cylindrical rods (Shaft).
3. To determine and analyse deflection of curved beams.
4. Experimental and analytical study of behaviour of struts with various end conditions.
5. To determine deflection of trusses – Horizontal and vertical deflection of various joints of a pin jointed truss.
6. Experimental and analytical study of a 3bar pin jointed Truss.
7. Experimental and analytical study of an elastically coupled beam.
8. To plot stress- strain curve for mild steel – Demonstration.

COURSE OUTCOMES:

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

- To acquire the knowledge about stresses and strains.
- To get knowledge about loading systems, types of supports and beams and understand the behaviour of different structural system for different loading and deflection.
- Able to calculate the about forces, moments and deflections.
- To verify and compare different theoretical and experimental theorems.
- Analyse and assess the behaviour and serviceability of the structures using analytical/experimental methods.

Fluid Mechanics Lab.			
Course Code	**LC-CE-213-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

COURSE OBJECTIVES:

- To understand the physical processes of fluid more closely.
- Various apparatus like, Verification of Bernoulli's theorem apparatus, venturimeter & Orifice meters, orifice & mouth piece apparatus Flow over notches apparatus, vortex flow apparatus etc helps to understand different process.

LIST OF EXPERIMENTS

1. Verification of Bernoulli's Theorem
2. Calibration of V notch
3. Calibration of Rectangular notch
4. Calibration of Trapezoidal notch
5. Study of Pressure Measuring Devices
6. Determination of Metacentric height
7. Hydrostatics Force on Flat Surfaces/Curved Surfaces
8. Venturimeter
9. Orifice meter
10. Determination of coefficient C_d, C_v, and C_c

COURSE OUTCOMES:

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

- Verification of Bernoulli's theorem.
- Calibration of different notches, venturimeter and orifice meter.
- Determination of different coefficient and their verification.
- Study the different property of fluid flow.

Surveying Lab			
Course Code	**LC-CE-215-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To use of Chain for linear measurement and traversing.
- To use of different compass for determination of directions and for traversing.
- To use different levels and determine the reduced levels, elevation and depressions of ground.
- To prepare maps using plane table by applying different methods.

LIST OF EXPERIMENTS

1. Chain Traversing
2. Compass Traversing
3. Fly Levelling
4. Cross Sectioning
5. Profile levelling
6. Plane Table surveying: Radiation and Intersection
7. Resection- 2 and 3-point problem with plane Table
8. Contouring and preparation contour map.
9. Use of tangent clinometer

COURSE OUTCOMES:

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

- Use conventional surveying tools such as chain/tape, compass, plane table, levels in the field for various civil engineering applications.
- Enter observation in field book, adjusting and plotting a traverse.
- To calculate the earth work for cutting and filling.
- To prepare contour maps of a small area and its importance in Civil Engineering.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION

Bachelor of Technology (Civil Engineering) Scheme effective from 2019-20

SEMESTER 4th

Sr. No.	Course Code	Course Title	Hours per week	Contact hours per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L-T-P			Class work	Theory	Practical	Total	
1.	HSMC-202-G	Organization Behavior	3-0-0	3	3	25	75	-	100	3
2.	PCC-CE-202-G	Hydraulic engineering	3-1-0	4	4	25	75	-	100	3
3.	PCC-CE-204-G	Design of concrete structure	3-1-0	4	4	25	75	-	100	3
4.	PCC-CE-206-G	Structural Analysis	2-1-0	3	3	25	75	-	100	3
5.	PCC –CE-208-G	Geomatics & Aerial surveying	3-1-0	4	4	25	75	-	100	3
6.	PCC-CE-210-G	Material Testing & Evaluation	3-0-0	3	3	25	75	-	100	3
7.	LC-CE-212-G	Hydraulic engineering lab	0-0-2	2	1	25	-	25	50	3
8.	LC-CE-214-G	Structural Analysis Lab	0-0-2	2	1	25	-	25	50	3
9.	LC-CE-216-G	Geomatics & Arial surveying Lab.	0-0-2	2	1	25	-	25	50	3
10.	LC-CE-218-G	Material Testing & Evaluation Lab.	0-0-2	2	1	25	-	25	50	3
				TOTAL	**25**					

Note:

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of Calculator and other materials will not be permitted in the examination.

2. (A) each student has to undergo practical training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc and its evaluation shall be carried out in the V semester on the basis of seminar, viva-voce, report and certificate of practical training obtained by the student.

Course Name	**:**	**ORGANIZATIONAL BEHAVIOUR**	
Course Code	**:**	**HSMC-202-G**	**External marks: 75**
Credits	**:**	**3**	**Internal marks: 25**
L-T-P	**:**	**3-0-0**	**Total marks: 100**

Course Objectives:
The objective of this course is to expose the students to basic concepts of management and provide insights necessary to understand behavioral processes at individual, team and organizational level.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

SYLLABUS

UNIT – 1

Introduction of Management- Meaning, definitions, nature of management; Managerial levels, skills and roles in an organization; Functions of Management: Planning, Organizing, staffing, Directing & Controlling, Interrelationship of managerial functions, scope of management & Importance of management. Management and social responsibility, difference between management and administration.

UNIT – 2

Introduction of organization:-
Meaning and process of Organization, Management v/s Organization;
Fundamentals of Organizational Behavior: Concepts, evolution, importance and relationship with other Fields; Contemporary challenges and opportunities of OB.
Individual Processes and Behavior-**Personality**- Concept, determinants and applications; **Perception-** Concept, process and applications, **Learning**- Concept ,theories ; **Motivation-** Concept, techniques and importance

UNIT - 3
Interpersonal Processes- **Teams and Groups**- Definition of Group, Stages of group development, Types of groups, meaning of team, merits and demerits of team; difference between team and group, **Conflict-** Concept, sources, types, management of conflict; **Leadership:** Concept, function, styles & qualities of leadership.
Communication – Meaning, process, channels of communication, importance ,barriers and overcome of communication..

UNIT - 4
Organizational Processes: Organizational structure - Meaning and types of organizational structure and their effect on human behavior; **Organizational culture** Elements, types and factors affecting organizational culture. **Organizational**

change:
Concept, types & factors affecting organizational change, Resistance to Change.

Course Outcomes: By the end of this course the student will be able to:
1. Students will be able to apply the managerial concepts in practical life.
2. The students will be able to understand the concept of organizational behavior at individual level and interpersonal level.
3. Students will be able to understand the behavioral dynamics in organizations.
4. Students will be able to understand the organizational culture and change

Suggested Books:

1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Stoner, J et. al, Management, New Delhi, PHI, New Delhi.
3. Satya Raju, Management – Text & Cases, PHI, New Delhi.
4. Kavita Singh, Organisational Behaviour: Text and cases. New Delhi: Pearson Education.
5. Pareek, Udai, Understanding Organisational Behaviour, Oxford University Press, New Delhi.
6. Robbins, S.P. & Judge, T.A., Organisational Behaviour, Prentice Hall of India, New Delhi.
7. Ghuman Karminder, Aswathappa K., Management concept practice and cases, Mc Graw Hill education.
8. Chhabra T. N., Fundamental of Management, Sun India Publications-New Delhi.

Hydraulic engineering			
Course Code	**PCC-CE-202-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To introduce the students to various hydraulic engineering problems like laminar flow, open channel flows, flow through pipes, hydraulic jump and its applications.
- At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION A

Module 1: **Laminar Flow**
Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity.

Module 2: **Turbulent Flow**
Reynolds experiment, Transition from laminar to turbulent flow, Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes

SECTION B

Module 3: Flow through Pipes
Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, siphon, power transmission through pipes, Analysis of pipe networks: water hammer in pipes and control measures, branching of pipes.

SECTION C

Module 4: Open Channel Flow: Uniform flow
Definition, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channel flow.
Uniform Flow- Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient 'n', Most economical section of channel, Computation of Uniform flow, Normal depth.

Module 5: Open Channel Flow: Non-Uniform Flow
Specific energy, Specific energy curve, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Channel Transitions, Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile

SECTION D

Module 6: Hydraulic Jump
Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump,

Module 7:
Surges, Positive and negative surges, Dynamics of Fluid Flow- Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation,

COURSE OUTCOMES:

- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic jump and its applications.

SUGGESTED BOOKS:

- Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth,
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
- Open channel Flow, K. Subramanya, Tata McGraw Hill.
- Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.
- Burnside, C.D., “Electromagnetic Distance Measurement,” Beekman Publishers, 1971
- Fluid Mechanic and Hydraulic machines R.K. BANSAL

DESIGN OF CONCRETE STRUCTURE			
Course Code	**PCC-CE-204-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- The aim of this course is to provide students with a thorough understanding of the design of reinforced concrete structures.
- To become familiar with professional and contemporary issues in the design and fabrication of reinforced concrete members.
- Be able to identify and interpret the appropriate relevant industry design codes.
- The course focuses on understanding the behaviour of reinforced concrete components and systems subjected to gravity as well as lateral loads.
- Topics covered will include: design of beams, Column and slabs, detailing of reinforcement, design of foundation and retaining wall.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION-A

Module 1: Design methodology in Reinforced Concrete & Working stress Method
Working stress and limit state methods, Limit state v/s working stress method, Building codes, Normal distribution curve, Characteristic strength and Characteristics loads, Design values, Partial safety factors and Factored loads, Stress-Strain relationship for concrete and steel. Working Stress Method: Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

Module 2: Limit State Method
Basic assumptions, Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement and design examples. Continuous Beams both method -Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear.

SECTION-B

Module 3: Concrete Reinforcement and Detailing

Requirements of good detailing, Cover to reinforcement, Spacing of reinforcement, Reinforcement Splicing, Anchoring reinforcing bars in flexure and shear, Curtailment of reinforcement. Analysis and Design of Sections in shear, bond and torsion, Diagonal tension, shear reinforcement, Development length, Anchorage and flexural bond, Torsional stiffness, equivalent shear, Torsional reinforcement, Design examples.

Module 4: Serviceability Limit State

Control of deflection, Cracking, Slenderness and vibrations, Deflection and moment relationship for limiting values of span to depth, Limit state of crack width, Design examples.

SECTION-C

Module 5: Slabs

General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Non-rectangular slabs, Openings in slabs, Design Examples.

Module 6: Retaining Walls

Classification, Forces on retaining walls, Design criteria, Stability requirements, Proportioning of cantilever retaining walls, counter fort retaining walls, criteria for design of counter forts, Design examples.

SECTION-D

Module 7: Columns

Effective length, Minimum eccentricity, Short columns, under axial compression, Uniaxial and biaxial bending, Slender columns. Design examples.

Module 8: Footings

Isolated and wall footings, Design examples. Foundations-Combined footings, raft foundation, design of pile cap and piles, under reamed piles, design examples.

Course Outcomes:

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

- Recognize the design philosophy of reinforced concrete structures.
- Be able to analyze reinforced concrete structural systems under gravity and lateral loads.
- Be able to design different elements of reinforced concrete structural systems subjected to gravity and lateral loads.
- Be able to analyze and design a complete structural system through a comprehensive design project.
- Summarize the fundamental mechanics of reinforced concrete and the empirical assumptions made for analysis.

- Be able to produce a complete project document and present in a concise and complete manner to include structural drawings and structural calculations.
- Design basic structural elements (beams, columns and slabs) according to the design approach of IS:456.

SUGGESTED BOOKS:

- Design Of Reinforced Concrete Structures By P.Dayaratnam, Oxford & IBH Pub.,N.Delhi.
- Design of Reinforced Concrete-Limit State Design By A.K.Jain, Nem Chand & Bros.,Roorkee.
- Design of Reinforced Concrete by I.C.Syal & A,K,Goel, A.H,Wheeler & Co.Delhi.Reinforced Concrete Design by S.N.Sinha, Tmh Pub.,N.Delhi.
- Sp-16(S&T)-1980, Design Aids For Reinforced Concrete to IS:456, BIS, N.Delhi.
- Reinfirced cement concrete design by Neelam Sharma , S.K.Kataria & sons, N.Delhi.
- Sp-34(S&T)-1987 Handbook on Concrete Reinforcement And Detailing`, BIS, N.Delhi.

STRUCTURAL ANALYSIS			
Course Code	**PCC-CE-206-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination: hrs	**3**

COURSE OBJECTIVES:

- To provide basic knowledge in mechanics of materials so that the students can solve real engineering problems and Design Engineering Systems.
- Covers the relationship between stress and strain on deformable solids, principal stresses, maximum shearing stress, and the stresses acting on a structural member.
- Applies analysis to members subjected to axial, bending, and Torsional loads.
- Learn to evaluate internal forces, moments and corresponding stresses in beams through problem solving sessions using different methods.
- This course provides foundation knowledge, skills and their application which are relevant to subsequent courses in Civil Engineering.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION-A

MODULE 1: Deflection of Statically determinate structures

Deflection of determinate beams by Double Integration Method, Conjugate Beam Method and Moment Area Methods, Principle of Virtual work (Unit load method) and Castigliano's theorem.

MODULE 2: Deflection of Statically determinate Frame & Truss

Deflection of determinate pin jointed trusses and rigid jointed frames by principle of virtual work, Strain Energy and Castiglino's theorem. Williot Mohr diagram method and Maxwell's laws of reciprocal theorem

SECTION-B

MODULE 3: Travelling Loads

Maximum Shear Force and Bending Moment diagrams for simply supported beams carrying following moving loads: A Single Concentrated Load, Uniformly Distributed Load, Two Concentrated Loads, fixed distance apart Series of Concentrated Loads, Enveloping parabola, equivalent UDL for BM and SF in each of the above cases.

MODULE 4: Influence Line

Influence lines for reactions, BM & SF for simply supported beam and Panelled Girders.

Influence lines for forces in trusses with top horizontal and curved both, Reversal of stresses, Use of influence lines for calculating design forces due to dead load and moving live loads. Influence lines using Muller Breslau principle.

SECTION-C

MODULE 5: Arches

Determination of horizontal thrust, shear force and bending moment diagram for:
1. Two Hinged Arches **2**. Three Hinged Arches **3**. Fixed Arches

MODULE 6: Column Analogy Method & Cable and Suspension Bridge

Elastic centre, properties of analogous column, application to beam & frames. Introduction of Cable and suspension Bridge uniformly loaded cables, Temperature stresses, and three hinged stiffening Girder and two hinged stiffening girder

SECTION-D

MODULE 7: Indeterminate Structures & Deflection methods

Introduction to Indeterminate Structures, Determination of kinematic and static indeterminacy of beams, frames and trusses, Slope Deflection and Moment Distribution Methods- Analysis of continuous beams & portal frames, Portal frames with inclined members.

MODULE 8: Kani's Method

Analysis of continuous beam and simple frames, Analysis of frames with different column lengths and end condition of the bottom storey.

Course Outcomes:

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

- Helps to determine the deflections and rotations produced by the three fundamental types of loads: axial, Torsional, and flexural.
- Identify the internal forces and moments in beams to develop shear force and bending moment diagrams. Assess section properties, bending and deflections in beams.
- Use various classical methods for analysis of indeterminate structures.
- Determine the effect of support settlements for indeterminate structures.
- Apply the concepts of ILD and moving loads on structures.
- Demonstrate the concepts of qualitative influence line diagram for continuous beams and frames
- Apply the methods of indeterminate truss analysis demonstrate the behaviour of arches and their methods of analysis.

Suggested Books:

- Statically Indeterminate Structures by C.K. Wang, McGraw Hill Book Co., New York.
- Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros., Roorkee.
- Indeterminate Structures by R.L. Jindal, S. Chand & Co., New Delhi.
- Theory of Structures, Vol. I, by S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.

GEOMATICS AND AERIAL SURVEYING			
Course Code	**PCC-CE-208-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To understand the principle of surveying on very large scale by locating precise horizontal controls.
- To learn about surveying applications in setting out works.
- To learn about determining absolute positions of a point using celestial measurements.
- To learn about different types of errors in measurements and their adjustment.
- To introduce the basic concept of photogrammetry, Remote sensing, and GIS.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION A

Module 1: Triangulation and Trilateration

Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations, Trilateration-Principle, Methods, advantages and disadvantages, introduction to total station.

Module 2: Survey Adjustment and computations

Definitions, types of error, weight of an observation, law of weights, most probable values, principle of least squares, method of correlates, normal equation, adjustment of triangulation figures by method of least squares.

SECTION B

Module 3: Astronomy

Definitions of astronomical terms, celestial coordinate systems, Napier's rule of circular parts, star at elongation, star at prime vertical, star at horizon, star at culmination, Astronomical triangle, various time systems: sidereal, apparent, solar and mean solar time, equation of time-its cause and effect, inter-conversion of time, determination of azimuth, latitude, longitude etc. by astronomical observations.

SECTION C

Module 4: Elements of Photogrammetry

Introduction, types of photographs, aerial camera, scale of a photograph, height displacements of vertical photographs, flight planning and its uses, crab and drift, number of photographs, relief displacements, Stereoscopic vision and stereoscopes, height determination

from parallax measurement, flight planning, principle of photo interpretation, photogrammetric monitoring.

SECTION D

Module 5: Introduction to remote sensing

Definition of Remote Sensing, types of remote sensing, remote sensing system and components. EMR source and characteristics, active and passive remote sensing, EMR propagation through medium, Role of atmosphere, Atmospheric windows, EMR interaction with objects, Spectral signature, EMR interaction with vegetation, soil and water. Satellite orbits and platforms: Geostationary and sun synchronous satellites, Resolution, Applications of remote sensing in civil engineering.

Module 6: Geographical Information System (GIS)

Definition, and Objectives, Components of GIS, Spatial data models: Raster and Vector, Data inputting in GIS, Linkage between spatial and non spatial data, Spatial data analysis: Vector and raster based spatial data analysis, Integration of RS and GIS data, Digital Elevation Model, GIS Software Packages.

Course Outcomes:

- Students would be able to know about advanced methods of locating horizontal controls.
- Set out various civil engineering structures, learn about different types of time and solution of astronomical triangle.
- Apply corrections to the measurements for different errors, and understand the difference between aerial photograph and satellite images and their use in map making.

Suggested Books:

- Chang.T.K. 2002: Geographic Information Systems, Tata McGrawHill
- Punmia, B.C. 2005: Surveying I and II, Luxmi Publications
- Charles D. Ghilani: Adjustment Computations: Spatial Data Analysis (Fifth Edition)
- Paul R Wolf: Elements of Photogrammetry
- G S Srivastava: An introduction to Geoinformatics
- Basudeb Bhatta: Remote Sensing and GIS
- G. L. Hosmer: Text-book on Practical Astronomy
- Various Online resources including NPTEL

Material Testing and Evaluation			
Course Code	**PCC-CE-210-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**3-0-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To provide the students an knowledge about various engineering materials.
- To understand the properties of ingredients of concrete.
- To study the behaviour of concrete under different states.
- To study about the concrete design mix.
- To understand special concrete and their use.
- To know various heavy construction projects and the equipments used for these.

Note: Examiner will set 9 questions in total, with two questions from each section and one question covering all the section which will be Q. 1. Question number 1 will be compulsory and of short answer type. Each question carry equal marks (15 marks). Students have to attempt five questions in total by selecting one question from each section.

COURSE CONTENT

SECTION-A

Module 1: Introduction to Engineering Materials

Cements, M-Sand, Concrete (plain, reinforced and steel fibre/glass fibre- reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics and Refractories, Bitumen and asphaltic materials, Glass and Plastics, Structural Steel and other Metals

Module 2: Limes, cement and mortars

Lime: classification of lime, manufacturing, testing of lime, storage of lime, Cement: cements composition, types of cement, manufacturing of ordinary portland cement, special types of cement, storage of cement, testing of cement. Mortars: Proportions of lime and cement mortars, mortars for masonry and plastering.

SECTION-B

Module 3: Concrete making materials

Proportions of cements, aggregates, water and admixtures; properties of fresh and hardened concrete, variability of concrete strength, extreme weather concreting, prestressed concrete; Durability of concrete - alkali aggregate reaction, reinforcement corrosion, freezing and thawing, etc.

Module 4: Mix Design

Principles of concrete mix design, basic considerations, Factors in the choice of mix design, outline of mix design procedure, ACI mix design practice, USBR method, British mix design method IS guidelines.

SECTION-C

Module 5: Steel and its testing

Types of steel, mechanical behaviour and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; tensile test – standards for different material (brittle, quasi-brittle, elastic and so on); Bending and torsion test, procedure and standards, Strength of ceramic, Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; concept of fracture mechanics; fracture toughness testing.

SECTION-D

Module 6: Testing and Evaluation Procedures

Testing of concrete mixes, description for various concrete, steels, aggregates ; Elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Shrinkage, Creep.

Module 7: Construction equipments and Heavy Construction

Construction of large structures, dams, bridges, multi storeyed buildings etc, Construction Equipments - crushers, hot mix, plants, dozers etc, Introduction to heavy construction equipment.

Course Outcomes:

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

- To explain various type of constructions in Civil Engineering.
- Design the concrete mix using ACI and IS code methods.
- Determine the properties of fresh and hardened of concrete.
- Design special concretes and their specific applications ensure quality control while testing/ sampling and acceptance criteria.

SUGGESTED BOOKS:

- Handbook of mix design - BIS
- Concrete Technology by M.S. Shetty.
- Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth- Heinemann
- Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition
- Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications
- Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
- E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
- American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

HYDRAULIC ENGINEERING LAB.			
Course Code	**LC-CE-212-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

COURSE OBJECTIVES:

- To understand the flow measurement in a pipe flow.
- To determine the energy loss in pipe flow.
- To study the loss due to pipe fittings.
- To measure the discharge in a open channel flow etc.

LIST OF EXPERIMENTS

1. To determine the coefficient of drag by Stokes law for spherical bodies.
2. To study the phenomenon of cavitations in pipe flow.
3. To determine the critical Reynolds number for flow through commercial pipes.
4. To determine the coefficient of discharge for flow over a broad crested weir.
5. To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
6. To study the scouring phenomenon around a bridge pier model
7. To study the scouring phenomenon for flow past a spur.
8. To determine head loss due to various pipe fittings.

COURSE OUTCOMES:

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

- Measure discharge in pipes determines the energy loss in conduits.
- Carry out discharge measurements in open channel etc.

STRUCTURAL ANALYSIS LAB			
Course Code	**LC-CE-214-G**	**External marks:**	**25**
Credits	**2**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- Structural Analysis experiments help to understand, to know the practical behaviour of the physical structures like beams, different arches, roof truss etc.
- A proper structural analysis of these structures helps the students to solve the practical problems.
- Different structural apparatus like Two-Hinge Arch, Three- Hinge Arch are studied in the laboratory.

COURSE CONTENT

SECTION-A

1	To verify moment area theorem regarding slope and deflection in a beam
2	To verify Maxwell's Reciprocal Theorem.
3	Begg`sdeformeter- verification of Muller Breslau principle
4	Experiment on a two – hinged arch for horizontal thrust and influence line for horizontal thrust
5	Analytical and experimental study of three hinged arch
6	Experimental and analytical study of unsymmetrical bending of a cantilever beam
7	Sway in portal frames – Demonstration

Course Outcomes:

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

- Various experimental and analytical studies for different structural members and their comparison.
- Demonstration of frame.
- Able to calculate the about forces, moments and deflections.
- To understand the Able to calculate the deflection of springs
- To verify and compare different theoretical and experimental theorems.

GEOMATICS AND ARIAL SURVEYING LAB.			
Course Code	**LC-CE-216-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To study and use of theodolite for angle measurements
- To use tacheometer for horizontal and vertical distances.
- To draw simple circular curves.
- To measure base line measurement.
- To study total station and its use for measuring distance, elevation and coordinates.

LIST OF EXPERIMENTS

1. Study various parts of a theodolite
2. Measurement of horizontal and vertical angles with theodolite
3. Measurement of Tachometric constants.
4. Calculating horizontal distance and elevations using tachometer.
5. Exercise of triangulation including base line measurement.
6. Setting out simple circular curves by deflection angle method.
7. Study the various parts of a total station.
8. Measurements of distance, elevation, coordinate with total station.
9. Special problems with total station.

COURSE OUTCOMES:

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

- Use the theodolite for measuring angles and use of tacheometer to determine distance and elevation.
- Draw simple circular curves.
- Calculate base line measurement and importance of triangulation.
- Use a total station to measure distance, elevation and coordinates.
- Use total station to plot a map of given area with software.

Material Testing & Evaluation Lab.			
Course Code	**LC-CE-218-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**
		Duration of Examination:	**3 hrs**

COURSE OBJECTIVES:

- To determine important properties of cement with different tests.
- To study the various test on aggregates and concrete.

LIST OF EXPERIMENTS

1. Standard consistency of cement using Vicat`s apparatus.
2. A) Fineness of cement by Sieve analysis and Blaine`s air permeability method.
   B) Fineness modulus of coarse and fine aggregates.
3. Soundness of cement by Le-Chatelier`s apparatus.
4. Setting time of cement, initial and final of cement.
5. Compressive strength of cement.
6. A) Measurement of specific gravity of cement.
   B) Measurement of Heat of Hydration of cement.
7. Moisture content and bulking of fine aggregate.
8. Workability of cement concrete by (a) Slump test (b) Compaction factor test (c) Flow table test.
9. Compressive strength of concrete by (a) Cube test, (b) Cylinder test
10. Indirect tensile strength of concrete-split cylinder test.
11. Modules of rupture of concrete by flexure test.
12. Bond strength between steel bar and concrete by pull-out test.
13. Non-destructive testing of concrete.

Course Outcomes:

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

- To able understand the importance of testing of cement, sand and aggregate.
- Able to perform different tests of concrete to check their suitability.
- Study of various properties of cement, aggregate and concrete for any project work.
- To check the suitability of material for practical application.

M.D. UNIVERSITY, ROHTAK

SCHEME OF STUDIES AND EXAMINATION

B.TECH. (CIVIL ENGINEERING)

SEMESTER 5th and 6th

Scheme effective from 2020-21

COURSE CODE AND DEFINITIONS

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
ESC	Engineering Science Courses
PCC	Professional Core Courses
LC	Laboratory Courses
PROJ	Practical Training / Survey Camp/Project Work

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION
Bachelor of Technology (Civil Engineering) Scheme effective from 2020-21
SEMESTER 5th

Sr. No.	Course Code	Course Title	Hours per Week	Contact Hours per Week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L-T-P			Class work	Theory	Practical	Total	
1.	PCC-CE-301-G	Hydrology and Water Resource Engineering	2-1-0	3	3	25	75	-	100	3
2.	PCC-CE- 303-G	Highway Engineering-I	2-1-0	3	3	25	75	-	100	3
3.	PCC-CE-305-G	Soil Mechanics	3-1-0	4	4	25	75	-	100	3
4.	PCC-CE-307-G	Water Supply and Treatment	2-1-0	3	3	25	75	-	100	3
5.	PCC-CE-309-G	Design of Steel Structure	3-1-0	4	4	25	75	-	100	3
6.	PCC-CE-311-G	Engineering Geology	2-1-0	3	3	25	75	-	100	3
7.	LC-CE-313-G	Highway Engineering –I Lab.	0-0-2	2	1	25	-	25	50	3
8.	LC -CE-315-G	Soil Mechanics Lab.	0-0-2	2	1	25	-	25	50	3
9.	LC -CE-317-G	Design of Steel Structure Drawing lab	0-0-2	2	1	25	-	25	50	3
10.	LC -CE-319-G	Engineering Geology Lab.	0-0-2	2	1	25	-	25	50	3
11.	PROJ-CE-301-G	Survey camp	-	-	2	25	-	25	50	-
12.	PROJ-CE-303-G	*Practical Training- I	-	-	-	-	-	-	* Refer note 2	
		TOTAL			**26**					

Note:

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of Calculator and other materials will not be permitted in the examination.
2. The evaluation of Practical Training-I will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded to grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.

HYDROLOGY AND WATER RESOURCE ENGINEERING			
Course Code	**PCC-CE-301-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To provide knowledge in the hydrological cycle, precipitation, evapotranspiration, infiltration and its measurements.
- To understand the physics of translate of rainfall into runoff modelling of various runoff techniques.
- To estimate the floods.
- To develop ability to apply the analytical and numerical techniques to ground and surface water models.
- To understand hydrographs and its methods.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Hydrologic Cycle, Water-Budget Equation, History of Hydrology and its Application in Engineering, World Water Balance, Sources of Hydrological Data.

Module 2: Precipitation

Forms of Precipitation, Characteristics of Precipitation in India, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth Area-Duration Relationships, Frequency of Point Rainfall, Intensity-Duration-Frequency Curves, Probable Maximum Precipitation (PMP), Rainfall Data in India.

SECTION-B

Module 3: Hydrological Abstractions

Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapotranspiration and its Measurement, Evapotranspiration Equations, Potential Evapotranspiration over India, Actual Evapotranspiration, Interception, Depression Storage, Infiltration Process, Initial Loss, Infiltration Capacity, Factors Affecting Infiltration, Measurement of Infiltration, Infiltration Indices.

Module 4: **Runoff**

Types of Runoff, Runoff Characteristics of Streams, Runoff Volume , Factor Affecting Runoff, Rainfall-Run off Relationships, Estimation of Runoff, SCS-CN Method of Estimating Runoff Volume, Flow Duration Curve, Flow-Mass Curve, Measurement of Stage of Runoff by-Staff Gauge, Wire Gauge, Automatic Stage Recorder and Stage Hydrograph; Stream Flow Measurement by Direct and Indirect Methods.

SECTION-C

Module 5: Hydrograph

Discharge Hydrograph, Components and Factors Affecting Shape of Hydrograph, Effective Rainfall, Base Flow Separation, Unit Hydrograph(UH)-Definition, Assumptions and its Derivation; Unit Hydrograph of Different Durations, Use and Limitations of UH, Snyder`S Synthetic UH

Module6: Floods and its Estimation

Introduction to Floods, Estimation of Floods by: Rational Methods, Empirical Formulae, Unit Hydrograph Technique, Flood Frequency Studies- Gumbel`s Method, Graphical Method.

SECTION-D

Module 7: Water Resource Planning-I

Role of Water in National Development, Water Resources and their Assessment , Planning Process, Environmental Consideration in Planning, System Analysis in Water Planning, Common Issues in Project Planning.

Module 8: Water Resource Planning-II

Functional Requirements in Multipurpose Projects, Multipurpose Planning, Basin Wise Planning, Long Term Planning, Reservoir Planning-Dependable Yield, Sedimentation in Reservoir, Reservoir Capacity, Empirical-Area Reduction Method.

Course outcomes

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

- Demonstrate the concepts of hydrograph, unit hydrograph and flood estimation.
- Estimate the hydrological parameters.
- Carry out statistical and probability analysis of hydrological data.
- Demonstrate the concepts of hydrological systems.
- Gain the basic knowledge of water resource planning.

Reference Books

- Engineering Hydrology by K.Subramanya.
- Hydrology by H.M.Raghunath.
- Water Resources Engineering by Linseley and Franzini
- Optimisation Theory and Applications by S.S.Roy
- Water Resources Systems Planning & Economics by R.S.Varshney.

HIGHWAY ENGINEERING-I			
Course Code	**PCC-CE-303-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To understand the importance of transportation and characteristics of road transport.
- To know about the history of highway development, surveys and classification of roads.
- To study the geometric design of highways.
- To study about traffic characteristics and design of intersections.
- To know about the pavement materials and design.
- To know about the different type of bituminous material and design.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION A

Urban, Rural Roads and their Cross-Sections, Design of Cross Section Elements- Right of Way, Width Considerations, Roadway, Shoulders, Kerbs Traffic Barriers, Medians, Frontage Roads; Facilities for Pedestrians, Bicycles, Buses and Trucks, Traffic Separators and Road Margin, Design of Sight Distances, IRC Recommended Values.

Module 1: Introduction

Modes of Transportation, History of Road Development, Scope of Highway Engineering, Road Development Plans in India, PMGSY and other Highway Projects, Classification of Highways, Locations and Functions, Road Patterns.

Module 2: Highway Development and Planning

Necessity and Significance of Highway Planning, Highway Alignment and Surveys, Factors Influencing Highway Alignment, Engineering Surveys for Alignment, Conventional and Modern Methods of Highway Alignments.

SECTION B

Module 3: **Highway Geometric Design**

Urban, Rural Roads and their Cross-Sections, Design of Cross Section Elements- Right of Way and Width Considerations, Roadway, Shoulders, Kerbs Traffic Barriers, Medians, Frontage Roads; Facilities for Pedestrians, Bicycles, Buses and Trucks, Traffic Separators and Road Margin, Design of Sight Distances, IRC Recommended Values.

Module 4: Design of Horizontal and Vertical Alignment

Super-Elevation and its Design, Extra-Widening, Radius of Circular Curves, Length of Transition Curves, Gradient, Summit and Valley Curves, Introduction to Software like MXROAD.

SECTION C

Module 5: Highway Material: Soil and Aggregate

Subgrade Soil and its Characteristics, Compaction Methods, Evaluation of Soil Strength by Different Tests, Aggregates and their Characteristics, Various Tests on Aggregates, IRC/IS Specifications for Suitability of Aggregates.

Module 6: Highway Material: Bituminous Materials and Bituminous Mixes

Bitumen: Origin, Preparation, Properties and their Testing Methods, Bituminous Road Binders: Requirements Constitution, Selection Criterion for Different Binders, Bituminous Emulsions and Cutbacks: Preparation, Characteristics, uses and their Tests. Bituminous Mixes: Mechanical Properties and Characteristics, Bituminous Mix Design: Methods, Performance-Based Bitumen Specifications, Polymers and Rubber Modified Bitumen in Bituminous Mixes, Waste Plastic in Bituminous Mixes.

SECTION D

Module 7: Traffic Engineering and Control

Traffic Characteristics, Traffic Studies and their Presentation, Traffic Capacity Studies, PCU and Axle Load Survey, Intersections Design, Design of Sign and Signals, Parking and Accident Studies, Highway Safety Measures.

Module 8: Intelligent Transportation Systems (ITS)

Objectives of Intelligent Transportation Systems, Historical Background, Benefits of ITS, Data Collection Techniques for ITS-Detectors, Automatic Vehicle Location, Automatic Vehicle Identification, Geographic Information Systems and Video Data Collection.

Course Outcomes

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

- Carry out surveys involved in planning and highway alignment.
- Design cross-section elements, sight distance, horizontal and vertical alignment.
- Implement traffic studies, traffic regulations and control, and intersection design.
- Determine the characteristics of pavement materials.

Reference Books

- Khanna, S.K. and Justo, C.E.G., Veeraragavan A., “Highway Engineering”, Nem Chand & Bros.
- Khanna, S.K. and Justo, C.E.G., “Highway Material Testing Manual”, Nem Chand & Bros.
- Kadiyali, L.R., “Traffic Engineering and Transportation Planning”, Khanna Publishers.
- G.V.Rao, Principles of Transportation and Highway Engg, Tata McGraw Hill Pub.

SOIL MECHANICS			
Course Code	**PCC-CE-305-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives:

- To provide Civil Engineering students with the basic knowledge regarding soil formation and composition.
- To explain the importance of three phase system of soil and how soil is properties estimated using three phase system.
- To impart knowledge on the various factors governing the Engineering behaviour of soils and carry out soil classification.
- To explain role of water in soil behaviour and how soil stresses, permeability and quantity of seepage are estimated.
- To determine shear parameters and stress changes in soil due to foundation loads.
- To estimate the magnitude and time-rate of settlement due to consolidation.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Soil Formation and its Basic Soil Properties

Scope of Soil Mechanics, Types of Soil, Origin of Soil and its Formation, Inter-Particle Forces, Soil Structure and Fabric, Major Soil Deposits of India, Three Phase System, Weight-Volume Relationships, Index Properties, Particle Shape and Size, Grain Size Analysis: Sieve Analysis and Hydrometer Analysis; Grain Size Distribution Curves, Consistency of Soils: Sensitivity, Thixotropy, Activity; Consistency Limits and their Determination.

Module 2: Classification and Permeability of Soils

Necessity of Classification, Classification on the Basis of Grain Size and on the Basis of Plasticity, Plasticity Chart, Textural Classification, Unified Soil Classification, IS Classification System Soil. Permeability, Darcy`s Law and its Validity, Discharge Velocity and Seepage Velocity, One Dimensional Flow, Factors Affecting Permeability, Laboratory and Field Determination of Permeability, Indirect Methods, Permeability of Stratified Deposits.

SECTION-B

Module 3: Effective Stress Concept

Principle of Effective Stress, Effective Stress under Hydrostatic Conditions and Under Hydro-Dynamic Conditions, Effective Stress in The Zone of Capillary Rise, Seepage Pressure, Quicksand Condition, Seepage Through Soil: Two Dimensional Flow, Flownets, Properties and Utilities of Flownet, Uplift Pressure, Piping, Protective Filter.

Module 4: Compressibility and Compaction

Definitions, Role of Moisture and Compactive Effort in Compaction, Moisture Density Relationship, Compaction in Laboratory and Field Conditions, Compactive Effect on Soil Properties, Compaction of Cohesionless Soils, Moderately Cohesive Soils and Clays, Field Control of Compaction.

SECTION-C

Module 5: Vertical Stress below Applied Loads

Boussinesq`s Equation, Vertical Stress Distribution Diagrams, Pressure Bulb, Vertical Stress Beneath Loaded Areas, Newmark`s Influence Chart, Westergaard`s Analysis, Contact Pressure, Approximate Stress Distribution Methods for Loaded Areas.

Module 6: Consolidation

Consolidation Process and its Types, Components of Total Settlement, One-Dimensional Consolidation Test, Typical Void Ratio-Pressure Relationships for Sands and Clays, Consolidation Parameters, Normally Consolidated and Over Consolidated Clays, Casagrande`s Graphical Method of Estimating Pre-Consolidation Pressure, Terzaghi`s Theory of One- Dimensional Consolidation, Determination of Coefficients of Consolidation, Time Rate of Consolidation.

SECTION-D

Module 7: Shear Strength

Mohr Stress Circle, Mohr-Coulomb Failure-Criterion, Relationship Between Principal Stresses at Failure, Drainage Conditions, Shear Strength Parameters and their Determination, Advantages and Disadvantages of Different Shear Tests, Shear Strength Characteristics of Clay and Sand, Partially Saturated Soils.

Module 8: Earth Pressure

Types of Lateral Earth Pressure, Rankine`s Active, Passive States of Plastic Equilibrium and Rankine`s Theory, Coulomb's Wedge Theory, Coulomb`s Active and Passive Earth Pressure Theory, Culmann`s Graphical Construction.

Course Outcomes

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

- Solve three phase system problems.
- Able to carry out soil classification.
- Solve any practical problems related to soil stresses estimation, permeability and seepage including flow net diagram.
- Estimate the stresses under any system of foundation loads.
- Solve practical problems related to consolidation settlement and time rate of settlement.

Reference Books

- Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publishers Distributors, N. Delhi
- Soil Mechanics and Foundations by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain; Laxshmi Publications (P) Ltd, N. Delhi.
- Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age International (P) Ltd., N. Delhi.
- Soil Engineering. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Publications, N.Delhi.
- Engineering Properties of Soils by S.K.Gulati, Tata-Mcgraw Hill,N.Delhi.
- Geotechnical Engineering. by P. Purshotam Raj, Tata Mcgraw Hill.
- Principles of Geotechnical Engineering by B.M. Das, PWS KENT, Boston.

WATER SUPPLY AND TREATMENT			
Course Code	**PCC-CE-307-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To quantify the water demands and its variations.
- To analyze the different characteristics of water.
- To study the different units of treatment.
- To deal with water supply and water distribution to consumers.
- To develop basic knowledge about the water pollution and its control.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Water Supply System – Planning, Objectives, Design Period, Population Forecasting, Water Demands and its Variations, Sources of Water and their Characteristics, Development and Selection of Source, Intakes and their Types.

Module 2: Water Characteristics

Sources of Impurities, Type of Impurities in Water and their Sanitary Significance, Physical, Chemical and Bacteriological Analysis of Water, Indian and Global Standards of Water Quality, Effluent Standards.

.SECTION-B

Module 3: Water Treatment

Necessity of Water Treatment , Flow Diagram of Different Treatment Units; Constructional Details, Working and Operation of Preliminary Units, Aeration Units, Sedimentation Units and their Types, Features and Design Aspects; Mixing Basins, Flocculation; Filtration – Mechanisms, Characteristics and Design of Slow and Rapid Sand Filtration Unit; Disinfection - Theory, Methods and Practices.

Module 4: Advanced Water Treatment

Water Softening, Desalination- R.O. Plant, Demineralization, Adsorption, Ion Exchange, Membrane Systems; Iron and Manganese Removal, Defluoridation, Dissolved Solids Removal.

SECTION-C

Module 5: Water Conveyance System

Methods of Supply - Intermittent and Continuous, Pipes and Conduits for Water- Pipe Materials, Laying, Jointing and Testing of Pipes, Valves and Appurtenances

Module 6: Pumps and Pumping Stations

Need of Pumping, Terminology used, Classification of Pumps, Different Type of Pumps used in Water Supply, Power of Pumping, Total Lift of Pump, Location of Pumping Station, and Site Selection.

SECTION-D

Module 7: Water Distribution System

Requirements of Water Distribution, Type of Distribution System, Layout of Distribution System – Dead End System, Grid Iron System, Ring System, Radial System and their Merits and Demerits; Distribution Reservoir-Functions and Determination of Storage Capacity, Water Distribution Network- Layout, Capacity, Pressure Requirements, Analysis; Leak Detection and Maintenance of Water Distribution Network.

Module 8: Water Pollution and Control

Sources of Water Pollution, Types and their Effects, Preventive Measures and Control of Water Pollution, Description of Legislation Related to Water Pollution Control.

Course Outcomes

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

- Understand the sources of water and characterization of water including physical, chemical and biological water quality parameters.
- Develop basic knowledge about the transmission, storage and distribution of water.
- Knowledge of water pollution and its control.
- Recommend the degree of treatment required for the water.

Reference Books

- Water Supply Engineering: S.R. Kshirsagar.
- Water Supply Engineering: S.K. Garg.
- Water Supply Engineering: B.C. Punmia.
- Environmental Engineering: Peavy H. S., Rowe D. R. and Tchobanoglous G.
- Introduction to Environmental Engineering: Davis M. L. and Cornwell D. A.
- Water Supply and Sanitary Engineering: Birdie, G. S. and Birdie 8. Manual on Water Supply and Treatment: Ministry of Urban Dev., New Delhi.

DESIGN OF STEEL STRUCTURE			
Course Code	**PCC-CE-309-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To learn IS 800-2007 code of practice for the design of Compression, Tension and Flexural members using various cross-sections.
- To study and design of various connections.
- To understand behaviour of flexural members and the design laterally restrained and unrestrained beams.
- To impart practical knowledge of steel structures and their application.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Stress Strain Curve for Steel, Composition and Properties of Structural Steel, Types of Steel Structures, Types of Sections, Stresses in Structural in Steel, Design Consideration, Codes and Specification, Introduction of Design Philosophies, Different Kind of Loads and their Combination.

Module 2: Connections

Terminology, Various Types of Connections and their Joints-Riveted, Bolted, Pin, Welded Connections; their Design for Different Loads, Modes of Failure

SECTION-B

Module 3: Design of Tension Member

Types of Tension Members, Factors Affecting Strength of Tension Member, Design of Tension Members, Lug Angles, Splices, Gussets as per Indian Codal Provision.

Module 4: Design of Compression Members

Behaviour of Compression Members, Types of Compression Member, Effective Length, Slenderness Ratio, Sections Used for Compression Member, Flexural-Torsional Buckling, Prevention of Buckling Failure, Design of Compression Members, Design of Built Up Columns- laced and battened columns

including the design of lacing and battens, Design of Compression Members Composed of Two Components Back-To-Back.

SECTION-C

Module 5: Design of Beams

Different Types of Sections in Beams, Lateral Stability of Beam and Factors Affecting Lateral Stability, Design of Laterally Supported and Unsupported Beams, Web Buckling, Web Crippling, Diagonal Buckling, Torsional Buckling, Effect Of Holes In Beams.

Module 6: Design Column Bases and Footings

Types of Column, Bases-Slab Bases, Gusset Base, Design of Base plate and Gusseted Base, Design of Bases for Eccentrically Loaded Columns, Anchor Bolts and Shear Connectors, Grillage Foundation

SECTION-D

Module 7: Plastic Analysis and Design

Plastic Analysis- Scope, Theory and General Requirement, Ultimate Load-Carrying Capacity of Tension Members, Compression Members, Flexural Members, Shape Factor, Load Factor, Mechanisms, Plastic Collapse, Condition in Plastic Analysis, Method of Analysis, Plastic Analysis And Design of Steel Beams and Simple Portal Frames.

Module 8: Design of Gantry Girder

Loading Consideration, Selection Criteria of Gantry Girder, Specification, Design of Gantry girder

Course Outcomes

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

- Apply the IS code of practice for the basic design of steel structural elements.
- Design compression and tension members using simple and built-up sections.
- Analyze the behaviour of bolted connections and design them.
- Design welded connections for both axial and eccentric forces
- Students will be able to understand the basic of steel structure with practical aaplication.

Reference Books

- Design of steel structures, A.S.Arya&J.L.Ajmani, Nemchand& Bros., Roorkee.
- Design of steel structures (LSM), N,.Subramanian, Oxford Publication.
- Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
- Design of steel structures, S.M.A.Kazmi&S.K.Jindal, Prentice Hall, New Delhi.
- Design of steel structures, S.K.Duggal, TMH Pub, New Delhi.

ENGINEERING GEOLOGY			
Course Code	**PCC-CE-311-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To make the students familiar interior of Earth.
- To aware about different geological maps, different organizations related with geological study.
- To provide knowledge about geological forces and formation of Superficial Deposits.
- To make students study various minerals
- To aware about the basics of various types of rocks and their formation
- To provide adequate knowledge about geological considerations in civil engineering projects

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Scope, Subdivision of Geology, Interior of Earth, Importance of Geological Studies in Various Civil Engineering Projects, Department Dealing with this Subject in India and their Scope of Work- GSI, Granite Dimension Stone Cell, NIRM; Use of Geological Maps and Interpretation of Data.

Module 2: Physical Geology

External and Internal Geological Forces Causing Changes; Weathering, Erosion and Denudation of the Surface of the Earth; Factors Affecting Weathering and Product of Weathering; Superficial Deposits and its Geotechnical Importance: Water Fall and Gorges, River Meandering, Alluvium, Glacial Deposits, Desert Landform, Loess, Mudflows, Coastal Deposits.

SECTION-B

Module 3: Mineralogy

Origin and Composition of Minerals, Physical Properties of Minerals, Susceptibility of Minerals to Alteration, Rock Forming Minerals, Megascopic Identification of Common Primary and Secondary Minerals.

Module 4: Petrology

Rock Formation Processes, Ternary Diagram, Igneous Petrology- Volcanic Phenomenon, Types of Volcanic Eruption, Chemical and Mineralogical Composition, Texture and its Types, Sedimentary Petrology- Mode of Formation, Mineralogical Composition, Texture and its Types; Metamorphic Petrology- Agents and Types of Metamorphism, Metamorphic Grades, Mineralogical Composition, Structures and Textures.

SECTION-C

Module 5: Structural Geology

Forms and Structures of Rocks, Stress and Strain in Rocks, Deformation and Tectonics, Dip and Strike, Bedding Planes and Outcrops; Fold- Types and Nomenclature, Criteria for Their Recognition in Field; Faults: Classification, Recognition in Field.

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Module 6: Properties of Rock Masses

Sub Surface Investigations of Rocks and Engineering Characteristics of Rocks Masses; Field and Laboratory Tests on Rocks, Stress Deformation and Bearing Capacity of Rocks, Important Variables Influencing Rock Properties and Behaviour, Measurement of Velocity of Sound in Rock.

SECTION-D

Module 7: Geology of Dam and Reservoir Site

Geological Consideration for Selecting Dam and Reservoir Site, Causes of Failure of Reservoir, Favourable and Unfavourable Conditions in Different Types of Rocks in Presence of Various Structural Features, Precautions to Counteract Unsuitable Conditions.

Module 8: Geological Hazards

Rock Instability and Slope Movement; Concept of Sliding, Consequences of Land Sliding, Prevention by Surface Drainage, Slope Reinforcement by Rock Bolting and Rock Anchoring; Earthquake: Magnitude and Intensity of Earthquake, Seismic Waves; Seismic Zones in India.

Course Outcomes

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

- To identify different minerals, their physical properties and rock forming minerals.
- To understand the basics of various types of rocks and their formations, texture, composition.
- To determine different geological forces and formation of Superficial Deposits.
- Conduct geological survey by knowing the interior of Earth.
- To study different geological maps with geological symbols.
- To acquire the knowledge about geological considerations in civil engineering projects.

Reference Books

- A textbook of Geology by P.K Mukherjee
- Physical and General Geology by SK Garg
- Engineering and General Geology by Prabin Singh.
- Introduction of physical Geology by A.holmes

HIGHWAY ENGINEERING-I LAB			
Course Code	**LC-CE-313-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

Course Objectives

- To understand the characterization of highway materials as per IRC/IS codes.
- To learn the mix designs of granular, bituminous and CC mixes
- To learn the use of modern equipment for traffic studies and pavement evaluation

List of Experiments

1. To determine the flakiness index and elongation index of aggregates.
2. To determine the California Bearing Ratio (CBR) value of soil and aggregate.
3. To determine the impact value of aggregate and composite material.
4. To determine the crushing strength of aggregate and composite material.
5. To determine the abrasion and attrition value of aggregate by using:
    a) Deval abrasion test.
    b) Los Angeles abrasion test
    c) Dory abrasion test.
6. To determine the water absorption of aggregate.
7. To find out the durability of aggregate.
8. To determine the mechanical and wear properties of tiles/blocks:-a) Flexural strength b) Abrasion value of tiles/blocks.
9. Traffic volume and speed study using videography technique.(Demonstration only)

Course Outcomes

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

- Gain Engineering knowledge of the subject and apply it for judging the suitability of highway materials.
- Make investigations, use modern test tools and develop solutions to use highway materials for sustainable development that preserves the environment.
- Understand the norms of engineering practice and the need for life-long learning as per their exposure to relevant IS/IRC specifications.

Reference Books

- Khanna,S.K. and Justo, C.E.G.,Veeraragavan A.,"Highway Engineering",Nem Chand &Bros.
- Khanna,S.K. and Justo,C.E.G.,"HighwayMaterialTestingManual",NemChand& Bros.
- Kadiyali,L.R.,"TrafficEngineeringandTransportationPlanning",Khanna Publishers.

SOIL MECHANICS LAB			
Course Code	**LC-CE-315-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

Course Objectives

- To estimate index properties of soil.
- To estimate consistency limit of fine grained.
- To estimate shear strength of soils by direct shear test & unconfined compressive test.
- To estimate the engineering properties of the soils by density test, permeability test and consolidation test

List of Experiments

1. Visually classify the soil and to determine the moisture content (water content) of a given soil sample.

2. Determination of specific gravity of given soil sample.

3. To classify the coarse grained soil by sieve analysis using particle size distribution curve.

4. To determine liquid limit and plastic limit.

5. To determine field density of soil by
    a. Sand replacement method
    b. Core cutter method
6. To determine the optimum moisture content and maximum dry density of soil by Standard Proctor Test.

7. To determine the coefficient of permeability of soil sample at desired density by suitable method.

8. To determine the Unconfined compressive strength of cohesive soil sample.

9. To determine the shear strength parameters of the given granular soil sample at known density and moisture content by Direct shear test.

10. To determine the shear strength parameters of fine grained soil sample by unconsolidated undrained (UU) Triaxial test.

Course Outcomes

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

- Determine index properties of soils.
- Students will learn and acquire knowledge to classify soils.
- To understand the techniques, skills and modern engineering tools necessary for engineering practice.
- Determine engineering properties of soils solutions.
- Classify soil by physical observation of the soils.
- Carry out interpolation among the estimated soil design parameters.

Reference Books

- Soil Testing for Engineers by S.Prakash, PK Jain, Nem Chand & Bros.,Roorkee.
- Engineering Soil Testing by Lambi, Wiley Eastern.
- Engineering Properties of Soils and their Measurement by J.P.Bowles, McGraw Hill.
- Soil Engineering in Theory and Practice, Vol.II,
- Geotechnical Testing and Instrumentation by Alam Singh, CBS Pub.

DESIGN OF STEEL STRUCTURES DRAWINGS			
Course Code	**LC-CE-317-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

Course Objectives

- To draw various steel connection.
- To draw various beam and column connections.
- Drawing of girders, different trusses and joints.
- To draw various steel members i.e. tension and compression members.

List of Experiments

1. To Prepare Detailed Drawing for various types of Bolted Connection.
2. To Prepare Detailed Drawing for various types of Welded Connection.
3. To Prepare Detailed Drawings for Laced And Battened Columns.
4. To Prepare Detailed Drawings of Built Up Beams.
5. To Prepare Detailed Drawing of Column Bases–Slab Bases–Gusset Base.
6. To Prepare Detailed Drawings of Grillage Foundations.
7. To Prepare Detailed Drawing of Beam to Column Connections.
8. To Prepare Detailed Drawings of Gantry Girder.
9. To Prepare Drawing of Plate Girder.
10. To Prepare Drawing of Circular and Rectangular Water Tank.
11. To Prepare Drawing of various types of Roof Trusses.

Course Outcomes

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

- Understand the study of drawing for various components like connection, trusses, girders, joints etc.
- Implementation of design in drawing forms with by laws.
- Apply relevant Indian Standard provisions to ensure safety and serviceability of structural steel elements.

Reference Books:

- Structural design & Drawing, S. Krishnamurthy, Volume-3.
- Design & Drawing of steel Structure, Sajjan V. Wagh.
- Structural design & Drawing, reinforced concrete & Steel, N. Krishna Raju.
- Steel Structures (Design & Drawing), A.K. Upadhayay.

ENGINEERING GEOLOGY LAB			
Course Code	**LC-CE-319-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

Course Objectives

- To study and identify different minerals with their physical properties.
- To aware about different types of rocks and rock forming minerals.
- To study the different geological formations.

List of Experiments

1. To Study physical properties of minerals.
2. To study and identify different minerals: Silica group, Feldspar group, Carbonate group and Pyroxene group.
3. To study and identify rocks forming silicate and ore minerals.
4. Identification of Igneous Petrology: Acidic Igneous rock: Granite and its varieties, Pumice, Scoria, Pegmatite and Volcanic Tuff.
5. Identification of Sedimentary Petrology: Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
6. Identification of Metamorphic Petrology: Marble, Slate etc.
7. To determine Dip and strike of formations using
    a) Clinometer
    b) Brunton compass
8. Geological cross sections and Study of topographical features from Geological maps with identification of symbols.
9. Study of models of Geological structures and outcrops patterns of different types of rocks and landforms.

Course Outcomes

At the end of the course, students would be able to:

- To identify different materials and their physical properties.
- To identify different types of rocks on the basis of their formation.
- To identify geological symbols and make geological maps.
- To measure geological formations of different types.

Reference Books

- A textbook of Geology by P.K Mukherjee
- Engineering and General Geology by Prabin Singh.

SURVEY CAMP			
Course Code	**PROJ-CE-301-G**	**External marks:**	**25**
Credits	**2**	**Internal marks:**	**25**
L-T-P	**0-0-0**	**Total marks:**	**50**

Course Objectives

- Survey camp emphasizes on field application of basic survey task such as triangulation, base line measurement, leveling, contouring and topographic surveying of land using plane table methods.
- It imparts knowledge of projection of land features on a plane sheet on a chosen scale.
- To make the student capable of drawing survey site plans and maps independently of a chunk of land of hilly area.

COURSE CONTENT

The survey camp is to be carried out by the students at suitable site. Different group of students will be asked to survey a particular area by using appropriate instruments issued to them. They will use different methods of surveying i.e. leveling, base line measurement, contouring, triangulation, plane table method to locate different control points. The students will plot important objects and features of the area under consideration on plane table sheet and prepare topographic map of the area.

Course Outcomes

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

- Use instruments like Auto level, Total station, Tachometer and other important survey instrument.
- They will gain experience of preparing site maps of the objects in the area under consideration with contours.
- Make significant survey decisions on survey works whenever necessary especially when facing problems at sites.
- To carry out engineering survey work confidently.

Reference Books

- Punmia B.C., Surveying, Volume 1, Laxmi Publications.
- Punmia B.C. Surveying, Volume 2, Laxmi Publications.
- N N Basak, Surveying and Levelling TMH Private Ltd.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION
Bachelor of Technology (Civil Engineering) Scheme effective from 2020-21
SEMESTER 6th

Sr. No.	Course Code	Course Title	Hours per Week	Contact Hours per Week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L-T-P			Class work	Theory	Practical	Total	
1.	PCC-CE-302-G	Irrigation Engineering	3-1-0	4	4	25	75	-	100	3
2.	PCC-CE- 304-G	Foundation Engineering	3-1-0	4	4	25	75	-	100	3
3.	PCC-CE-306-G	Highway Engineering-II	3-1-0	4	4	25	75	-	100	3
4.	-	*Elective-I	2-1-0	3	3	25	75	-	100	3
5.	-	**Elective-II	3-1-0	4	4	25	75	-	100	3
6.	LC-CE-308-G	Environmental Engineering Lab.	0-0-2	2	1	25	-	25	50	3
7.	LC -CE-310-G	Foundation Engineering lab	0-0-2	2	1	25	-	25	50	3
8.	LC -CE-312-G	Highway Engineering-II Lab.	0-0-2	2	1	25	-	25	50	3
9.	ESC-302-G	Computer aided Civil Engineering Design	1-0-2	3	2	25	-	25	50	3
		TOTAL			**24**					

	Course Title	Course Code
*Elective -I	1. Waste Water Treatment	PEC-CEEL -302 G
	2. Air & Noise Pollution Control	PEC-CEEL -304 G
	3. Environmental Impact Assessment	PEC-CEEL -306 G
**Elective –II	1. Advanced Concrete Structure	PEC-CEEL -308 G
	2. Pre-Stressed Concrete	PEC-CEEL -310 G
	3. Repair & Rehabilitation Of Structure	PEC-CEEL -312 G

Note:

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of Calculator and other materials will not be permitted in the examination.

2. Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the VII semester.

IRRIGATION ENGINEERING			
Course Code	**PCC-CE-302-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To make the students conversant with introduction to irrigation and national policies.
- To understand the basic methods of irrigation and soil water relation.
- To expose the students to water logging and land reclamation.
- To provide adequate knowledge regarding river training and canal outlet.
- To have adequate knowledge of drainage work.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Scope and Necessity of Irrigation, Different Water Resources, Development of Irrigation in India, Irrigation Systems and its various types, Benefits of Irrigation, National Water Policy, Impacts of Irrigation

Module 2: Water Requirement of Crops

Crops and Crop Seasons in India, Field Capacity, Wilting Point, Duty and Delta, Soil-Water Relationship- root zone soil water, infiltration, frequency of irrigation; Methods of Irrigation: Flooding Methods, Border Strip Method, Check Basin and Furrow Method, Sprinkler and Drip Irrigation Methods and their Design.

SECTION-B

Module 3: Canal Regulation Works

Canal Fall- Necessity and Location, Types of fall, Cross Regulator and Distributory Head Regulators, Silt Control Devices, Canal Escapes and its Types.

Module 4: Cross Drainage Works

Classification, Site Selection Criteria, Factors Affecting the Selection of Cross Drainage Works, Hydraulic Design of- aqueducts, syphon aqueducts, super passage, canal syphon and level crossing

SECTION-C

Module 5: Canal Outlets

Essential Requirements for an Outlet, Classification and Types of Outlets, Salient Features and Design: Pipe Outlet, APM Outlet and Open Flume Outlet; Flexibility Proportionality, Setting and Sensitivity of Outlet.

Module 6: Spillways and Energy Dissipations

Essential Requirements of Spillway and Spillway's Capacity, Types of Spillways and their Suitability, Ogee Spillways, Chute, Side Channel, Shaft and Syphon Spillways, Energy Dissipaters and its types ; Stilling Basins, USBR and IS Stilling Basins.

SECTION-D

Module 7: River Training

Objectives and Classification of River Training Works, Methods and Planning of River Training, Marginal Embankments, Guide Banks, Spurs, Cut Offs, Bank Protection and Launching Apron.

Module 8: Water Logging and Drainage

Water Logging- Effects, Causes & Preventive Measures, Land Reclamation: Process and Methods, Land Drainage, Benefits of Drainage, Essential Requirements of a Drain, Classification of Drains, its Operation and Maintenance.

Course Outcomes

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

- Learn historical development of irrigation in India and the policies framed
- Learn about various methods of irrigation
- Understand water logging effects and methods of land reclamation
- Know about river training, classification and requirement of canal outlets and cross drainage works.

Reference Books

- Garg, S. K., “Irrigation Water Power & Water Resources Engg.” Standard Publishers & Distributors, Delhi, 2002.
- Modi, P.N. “Irrigation, Water Resources and Water Power Engg.” Standard Book House, N. Delhi 2000.
- Arora, K R “Irrigation Water Power & Water Resources Engg.” Standard Publishers & Distributors, Delhi, 2002.
- Sharma, S.K., Principles and Practice of Irrigation Engineering, S.Chand & Co., 1984.
- Punmia, B.C., “Irrigation and Water Power Engg.” Standard Publishers, 2001.

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FOUNDATION ENGINEERING			
Course Code	**PCC-CE-304-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To emphasize the importance of soil investigations.
- To provide the knowledge for carrying out field investigations and to indentify soils in geotechnical engineering practice.
- To identify factors controlling soil behaviour and methods of dewatering.
- To understand different types of foundations and their importance in field.
- To identify different parameters for determining the bearing capacity of soil.
- To explain under which conditions deep foundation is needed and how to estimate pile and pile group capacity.
- To understand dynamic loading on soil foundation system and provide knowledge to lay out caissons and well foundation.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION A

Module 1: Sub-Surface Exploration

Scope and Objectives, Stages in Soil Exploration, Depth and Lateral Extent of Exploration, Guidelines for Various Types of Structures, Ground Water Observations, Methods of Bore Holes, Soil Sampling and Disturbance, Major Types of Samplers, Sounding Methods-SPT, SCPT, DCPT and their Interpretation, Geophysical Methods, Pressure-Meter Test, Exploration Logs.

Module2: Drainage and Dewatering

Ditches and Sumps, Well Point Systems, Shallow Well System, Deep Well Drainage, Vacuum Method, Electro-Osmosis, Consolidation by Sand Piles.

SECTION B

Module 3: Shallow Foundations

Types of Foundations, Depth of Foundation, Types of Shallow Foundations and their Relative Merits, Design Criteria for Structural Safety of Foundation: i) Location of Footing, ii) Shear Failure Criterion, iii) Settlement Criterion. Modes of Shear Failure, Rankine's Analysis Tergazi's Theory, Skempton's Formula, Meyerhoff's Bearing Capacity Theory, Effect of G.W.T. , Effect of Eccentricity on Bearing Capacity, Inclined Load, IS Code Recommendations.

Module 4: Settlement of Foundations

Various Causes of Settlement of Foundation, Allowable Bearing Pressure Based on Settlement, Elastic and Consolidation Settlement, Allowable Settlement According to IS Code Method, Plate Load Test and its Interpretation, Conventional Procedure of Proportioning of Footings, Situation Suitable for the Shallow Foundations.

SECTION C

Module 5: Bearing Capacity of foundations

Design Bearing Capacity, Bearing Capacity from Penetration Tests, Factors Affecting Bearing Capacity, Methods of Improving Bearing Capacity, Raft Foundations, Bearing Capacity of Raft in Sands and Clays, Various Methods of Designing Rafts, Seismic Considerations, Floating Foundations.

Module 6: Pile Foundations

Necessity of Pile Foundations, Classification of Piles, Selection Criteria, Load Capacity, Static Analysis, Analysis of Pile Capacity in Sands and Clays, Dynamic Analysis, Pile Load Tests, Negative Skin Friction, Batter Piles, Lateral Load Capacity, Uplift Capacity of Single Pile, Under-Reamed Pile, Batter Pile. Group Action in Piles, Pile Spacing, Pile Group Capacity, Stress on Lower Strata, Settlement Analysis, and Design of Pile Caps.

SECTION D

Module 7: Drilled Piers and Caisson Foundations

Drilled Piers- Types, Uses, Bearing Capacity, Settlement and Construction Procedure; Caissons- Types, Bearing Capacity, Settlement and Construction Procedure

Module 8: Well Foundations

Shapes, Depth of Well Foundations, Components, Factors Affecting Well Foundation Design Lateral Stability, Construction Procedure, Sinking of Wells, Rectification of Tilts and Shifts, Recommended Values of Tilts & Shifts as per IS: 3955

Course Outcomes

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

- To understand the importance of soil investigation and carry out sub-surface explorations for any civil engineering construction.
- To evaluate Bearing capacity factors and estimate bearing capacity using suitable methods.
- To do proper foundation proportioning for any kind of shallow foundation system.
- To estimate pile and pile group capacity for any kind of soils including group efficiency.
- To determine safe bearing capacity for various foundation system by considering shear and settlement criterion.

Reference Books

- Murthy, V.N.S, A text book of Soil Mechanics and Foundation Engineering, UBS Publishers & Distributors Pvt. Ltd., New Delhi 1999.
- Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publications Pvt. Ltd., New Delhi, 1995.
- Gopal Ranjan, ASR Rao, Basic and Applied Soil Mechanics, New Age Intetrnational Ltd. Publishers- N.Delhi, Edition No. - 3rd, 2016.
- Nainan P Kurian, Design of foundation Systems Principles and Practices, Narosa, 2011
- Braja M. Das, Principles of Foundation Engineering, Thomson Asia Pvt. Ltd., Singapore, 2005.
- Donald P. Coduto, Man-Chu Ronald Yeung and William A. Kitch, Geotechnical Engineering, Principles and Practices, PHI Learning Private limited, 2011.
- P.Purshotam Raj, Geotechnical Engg, Tata Mcgraw Hill, N.Delhi, Edition No. - I, 1995.

HIGHWAY ENGINEERING-II			
Course Code	**PCC-CE-306-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To understand the design of flexible and rigid pavements.
- To know the construction techniques of highways pavements.
- To understand the pavement failures and maintenance of pavements including strengthening.
- To learn economic evaluation of highway projects and sources of financing.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module1: Design of Flexible Pavements

Types of Pavement, Components of a Pavement and their Functions, Factors Effecting Design of Pavements, Review of Design by Old Methods, Design of a Flexible Pavement by CBR Method (as per Latest IRC Guidelines).Pavement Performance and its Methods- AASHTO and Asphalt Institute.

Module 2: Design of Rigid Pavements

Westergaard's Theory and Assumption, Critical Locations of Loading, Load and Temperature Stresses, Critical Combination of Stresses, Joints: Types, Requirements and Patterns, Spacing of Expansion and Contraction Joints; Design and Functions of Dowel and Tie Bars, IRC and AASHTO Methods of Rigid Pavement Design.

SECTION-B

Module 3: Construction of Bituminous Pavements

Various Types of Bituminous Constructions, Prime Coat, Tack Coat, Seal Coat and Surface Dressing; Construction of BUSG, Premix Carpet, BM, DBM and BC, Mastic Asphalt, Functions of Rollers, Paver and Hot Mix Plants, Introduction to Various IRC and MoRTH Specifications

Module 4: Highway Construction: Non-Bituminous Pavements

Subgrade and Embankment construction, Construction of GSB, WBM, WMM; Construction of DLC and PQC, Fixed Form and Slip-Form Paving Techniques

SECTION-C

Module 5: Pavement Failure and Remedies

Classification of Distresses in Pavements (Functional and Structural); Different Types of Distresses in Flexible and Rigid Pavements along with the Causes and Remedial Measures; Various Types of Maintenance of Pavements; Evaluation of Pavements: Functional and Non- Destructive Evaluation

Module 6: Strengthening of Existing Pavement

Objective of Strengthening, Different Types of Overlay, Design of Flexible Overlays on Flexible Pavement using Effective Thickness Approach and Deflection Approach, Benkelman Beam Method, Design of Other Types of Overlays.

SECTION-D

Module 7: Highway Drainage and Hill Roads

Necessity and Significance of Drainage, Mode of Ingress of Water in Highway Structure, Surface Drainage: -Types and Brief Design, Types of Sub-Surface Drainage, Drainage Inkling for the Roads in Hilly Areas, Special Characteristics of Hill Roads: Geometrics and Hair Pin Bends.

Module 8: Highway Economics and Finance

Need of Economic Evaluation, Highway User Benefits and Costs, Methods of Economic Evaluation, Highway Finance, PPP Projects, Rate Analysis of MoRTH-Standard Data Book and Cost Estimation

Course Outcomes

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

- Gain Engineering knowledge of the subject and apply it for the solution of problems related to pavement engineering.
- Design flexible and rigid pavements, make investigations, use modern tools and develop solutions to problems related to highway pavements.
- Understand the engineering solutions in societal context for sustainable development that preserve the environment and economical use of resources.
- Understand the norms of engineering practice and the need for life-long learning as per their exposure to relevant latest IS/IRC/MoRTH specifications.

Reference Books

- Highway Engg by S.K.Khanna& C.E.G. Justo, Veeraragavan A., Nem Chand Bros., Roorkee,2014.
- Principles and Practice of Highway Engg. By L.R.Kadiyali, N.B. Lal,Khanna Publishers, Delhi,2008.
- Principles of Pavement Design by Yoder,E.J&Witczak,M.W., John Wiley and Sons, USA.
- Tunnel Engineering by S.C.Saxena, Dhanpat Rai Publications,N.Delhi.
- A text book of Tunnel, Bridges and Railway Engg. By S.P.Bindr,Dhanpat Rai Delhi

ENVIRONMENTAL ENGINEERING LAB			
Course Code	**LC-CE-308-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

Course Objectives

- To quantify the water and wastewater pollutant.
- To analyze the physical characteristics of water and wastewater.
- To analyze the chemical characteristics of water and wastewater

List of Experiments

1. Determination of Turbidity of water by using suitable method
2. Determination of pH of given water sample.
3. Determination of Hardness of given water sample.
4. Determination of Residual Chlorine in given sample of water
5. Determination of Total Suspended and Dissolved Solids in given water sample.
6. Determination of Bio –chemical oxygen demand of waste water sample.
7. Determination of chemical oxygen demand of waste water sample.
8. Determination of Conductivity of given water sample.
9. Determination of Chlorides of given water sample
10. Determination of Alkalinity and Acidity of a given water sample.
11. Determination of Dissolved Oxygen of given waste water sample.

Course Outcomes

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

- Quantify the water and wastewater pollutant.
- Estimate the physical characteristics of water and wastewater.
- Analyze the chemical characteristics of water and wastewater

Reference Books

- Lab Manual, ISO 14001 Environmental Management, Regulatory Standards for Drinking Water and Sewage disposal.
- Clair Sawyer and Perry McCarty and Gene Parkin, “Chemistry for Environmental Engineering and Science”, McGraw-Hill Series in Civil and Environmental Engineering.
- Guide manual: Water & wastewater analysis, Central Pollution Control Board, Govt. of India.
- APHA standard methods for the examination of water and wastewater
- Water supply engineering, S.K. Garg

FOUNDATION ENGINEERING LAB			
Course Code	**LC-CE-310-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

Course Objectives

- To aware the students about hydrometer method.
- To estimate the relative density and maximum dry density of soils.
- To aware the importance of SPT, consolidometer and Triaxial test for selection of foundation.
- To estimate shear strength parameters of soil by Triaxial shear test.
- To estimate consolidation parameters of clayey soil.
- To aware about the importance of sampling and aware about the significance of plate load test.

List of Experiments

1. To determine grain size analysis using Hydrometer method.
2. To determine relative density of granular Soils.
3. To determine shrinkage limit of fine grained soil
4. To determine shear strength properties for consolidated drained conditions using Triaxial test.
5. To determine shear strength properties for consolidated undrained condition using Triaxial test.
6. To determine consolidation parameters using consolidometer.
7. To determine bearing capacity parameters using Standard Penetration Test.
8. Demonstration of Undisturbed Sampling.
9. Demonstration of cone penetration test.
10. To study of Model Plate Load Test.

Course outcomes

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

- Classify soil using hydrometer method and estimate relative density of soils.
- To perform Triaxial test under different conditions.
- To understand the procedure and calculations of SPT and prepare soil investigation report.
- Carry out interpolation tests to determine consolidation and estimate shear strength parameters.
- To obtain soil sampling by suitable method.
- Determine essential parameters of plate load test.

Reference books

- Gopal Ranjan, ASR Rao, Basic and Applied Soil Mechanics, New Age International (P) Ltd. Publishers- N.Delhi, Edition No. - 3rd, 2016.
- P. Purshotam Raj, Geotechnical Engg, Tata Mcgraw Hill, N.Delhi, Edition No.- I, 1995.

HIGHWAY ENGINEERING-II LAB			
Course Code	**LC-CE-312-G**	**External marks:**	**25**
Credits	**1**	**Internal marks:**	**25**
L-T-P	**0-0-2**	**Total marks:**	**50**

Course Objectives

- To understand the characterization of highway materials.
- To learn the mix designs of granular, bituminous, CC mixes and composite materials.
- To learn the use of modern equipment for traffic studies & pavement evaluation.
- To know the standard specifications of IS/IRC/MoRTH for judging suitability of these materials

List of Experiments

1. To determine the flash and fire point of bituminous material.
2. To determine the softening point of paving bitumen.
3. To determine the specific gravity of bituminous material.
4. To determine ductility of bitumen.
5. To determine the hardness of bitumen.
6. To determine the grade of a given binder.
7. To determine the viscosity of bituminous material.
8. To determine the granular mix design.
9. To determine the bituminous mix design by Marshall's method.
10. To determine the cement concrete mix design for pavements.
11. Demonstration of BBD & Bump Integrator.

Course Outcomes

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

- Gain engineering knowledge of the subject and apply it for judging the suitability of highway materials.
- Make investigations, use modern test tools and develop solutions to use highway materials for sustainable development that preserves the environment.
- Understand the norms of engineering practice and the need for life-long learning as per their exposure to relevant IS/IRC specifications.

Reference Books

- Highway Engg by S.K.Khanna & C.E.G. Justo, Veeraragavan A., Nem Chand Bros., Roorkee,2014.
- Principles and Practice of Highway Engg. By L.R.Kadiyali, N.B. Lal,Khanna Publishers, Delhi,2008.

COMPUTER-AIDED CIVIL ENGINEERING DESIGN			
Course Code	**ESC-302-G**	**External marks:**	**25**
Credits	**2**	**Internal marks:**	**25**
L-T-P	**1-0-2**	**Total marks:**	**50**

Course Objectives

- To develop, analyze and design the various structural members in the fields of Civil Engineering using AutoCAD, STAAD Pro.
- To understand the design of structures using IS codes
- To provide the knowledge about methods of analysis and design of RCC and steel frames.

List of Experiments

1. To study the commands used in plans of buildings using AutoCAD.
2. To prepare 2 D architectural drawing
3. To prepare 3 D architectural drawing
4. To prepare the drawing of grillage foundation using Auto cad.
5. To study the commands used in modelling and design of structure using STAAD-Pro.
6. Analysis of 2D Frames.
7. Analysis of 3D Frames.
8. Design of 2D RCC frames and 2D Steel frames according to IS codes.
9. Design of 3D RCC frames and 3D Steel Frames according to IS codes.
10. Design of beams.
11. Analysis of truss frames.

Course Outcomes

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

- To understand and learn the various codal provisions.
- Ability to prepare 2D and 3 D plans of buildings.
- To efficiently analyze and design of beams, truss frames and staircase.
- To perform various methods of analysis of 2D, 3D frames.

References

- STAAD Pro Manual.
- IS 456, IS 1893, IS 800, IS 875.

ELECTIVE SUBJECTS

WASTE WATER TREATMENT			
Course Code	**PEC-CEEL-302-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To learn basics of sewage collection and design of sewers
- To learn the basics of sewage composition and its characteristics
- To have adequate knowledge about various sewage treatment processes and its design
- To provide adequate information on various disposal standards for treated effluents

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Importance and Necessity of Sanitation, Terms used in sanitation- Sullage, Sewage, Sewer and Sewerage, Sewerage Systems and their Suitability, Dry Weather Flow, Factors Affecting Dry Weather Flow, Flow Variations and their Effects on Design of Sewerage System.

Module 2: Design of Sewers

Types of Sewers and their Hydraulic Design, Material used for Sewer Construction, Joints and Sewer Appurtenances, Layout, Construction and Testing of Sewer Lines, Velocity in Sewers, Storm Water Sewers

SECTION-B

Module 3: House Drainage

Principles of House Drainage, Types of Pipes used for Drainage , Classification and Functions of Traps, Sanitary Fitting, System of Plumbing, House Drainage Plan and Ventilation of House Drainage.

Module 4: Wastewater Characteristics

Quality Parameters- Physical, Chemical and Biological Characteristics, Oxygen Demand, Indian Standards for Disposal of Effluents into Inland Surface Sources and on Land, Guidelines for Reuse of Treated Wastewater

SECTION-C

Module 5: Primary Sewage Treatment

Objectives, Flow chart of Conventional Treatment Units and their Efficiencies, Preliminary Treatment, Screening and Grit Removal Units, Principle, Types and Design of Primary Sedimentation Tank, Coagulation Aided Sedimentation Tank, Flocculation,

Module 6: Secondary Sewage Treatment

Concept of Organic Matter Removal, Aerobic and Anaerobic Treatment Processes, Activated Sludge Process, Conventional and Extended Aeration Systems, Trickling Filters, Aerated Lagoons, septic tank, Waste Stabilization Ponds, Oxidation Ditches, Up-Flow Anaerobic Sludge Blanket Process.

SECTION-D

Module 7: Sludge Treatment

Objectives, Sludge Digestion, Digestion and Disposal of Primary and Secondary Sludge, Factors Affecting Sludge Digestion, Thickening of Sludge, Anaerobic Digestion of Sludge, Sludge Digestion Tank, Sludge Conditioning and Dewatering, Sludge Drying Bed

Module 8: Sludge Disposal

Standards of Wastewater Disposal, Modes of Disposal of Treated Sludge, Self-Purification of Streams, Oxygen Sag Curve, Sewage Farming, Sodium Hazards, Soil Dispersion System

Course Outcomes

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

- Estimate quantity of sewage and design sewerage system
- Determine the various characteristics of sewage
- Design various sewage treatment units
- Plan reuse of treated effluent and select appropriate disposal option

Reference Books

- Environmental Engineering: Peavy H. S., Rowe D. R. and Tchobanoglous G.
- Wastewater Engineering, Collection, Treatment and Disposal: Metcalf and Eddy
- Water Supply and Sanitary Engineering: Birdie, G. S. and Birdie
- Sewage and Sewage Treatment: S.K. Garg.
- Sewage and Sewage Treatment: S.R. Krishansagar.
- Waste Water Engineering: B.C. Punmia.
- Manual on Sewerage and Sewage Treatment: Ministry of Urban Dev., New Delhi.

AIR AND NOISE POLLUTION CONTROL			
Course Code	**PEC-CEEL-304-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- Understanding of basic concepts of air pollution.
- To understand the basic characteristics of air pollutants.
- To provide adequate knowledge about the noise pollution.
- To have adequate knowledge on various type of sounds.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Air Pollution

Composition and Structure of Atmosphere, Air Pollution and Global Climate, Air Quality Criteria, Emission Standards, National Ambient Air Quality Standards, Air Quality Management in India

Module 2: Sources, Classification and Effects

Sources and Classification of Air Pollutants, Type of Air Pollutants, Pollution due to Automobiles, Analysis of Air Pollutants – Chemical, Instrumental and Biological Methods; Air Pollution and its Effects on Human health, plants, animals and microbes, archaeological monuments and aesthetics,

SECTION-B

Module 3: Pollutant Dispersion

Concept of Atmospheric Stability, Adiabatic and Environmental Lapse Rate, Plume Behaviour, Terrain and Structure on Pollutant Dispersion, factors affecting Pollutant Dispersion, Concept of Maximum Mixing Depth and Ventilation Coefficient, Plume Rise and Effective Stack Height.

Module 4: Air Quality

Objectives, Time and Space Variability in Air Quality; Air Sampling Design, Analysis and Interpretation of Air Pollution Data, Introduction to Air Quality Index and Comprehensive Environmental Pollution Index and its Application, Sampling and Measurement of Air Pollutants Guidelines of Network Design in Urban and Rural areas, Stack Monitoring.

SECTION-C

Module 5: Dispersion Modelling and Impacts of Air Pollution

Dispersion modelling, it's Applications and Limitations, Gaussian Plume Model and GLC Determination, Global Environmental Issues: Acid Rain, Global Warming, Smog, Ozone layer depletion, Combustion of Fuel, Indoor Air Pollution, Various Treaties and Protocols: Kyoto Protocol and Montreal Protocol.

Module 6: Air Pollution Control

Introduction to Control Methods and Equipment for Particulate Matter and Gases, Design and Working of Scrubbers, Electrostatic Precipitator, Gravity Settlers, Cyclone Separator, Filter Bags , Adsorption by Liquids, Adsorption by Solids, Combustion Odours and their Control

SECTION-D

Module 7: Noise Pollution

Sound and Noise, Sources of Noise Pollution – Environmental and Industrial, Characteristics of Sound and its Measurement, Levels of Noise, Noise Rating Systems, Noise Level Standards, Outdoor and Indoor Noise Propagation; Psychoacoustics and Noise Criteria Curves

Module 8: Effects of Noise and Control Methods

Effects on Human and Environment, Infra-Sound, Ultrasound, Impulsive Sound and Sonic Boom; Noise Standards and Permissible Values; Instrumentation and Monitoring Procedure, Noise Indices and Control Methods

Course Outcomes

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

- To understand various air pollutants
- Analyze various types of noises.
- To understand various methods of control of air pollution.
- To understand various methods of control of noise pollution.

Reference Books

- Air and Noise Pollution Control : Lawrence K. Wang
- Advanced Air and Noise Pollution Control: Volume 2 : Lawrence K. Wang
- Environmental Pollution and Health : V. K Ahluwalia
- Atmospheric pollution: Mark Z. Jacobson

ENVIRONMENTAL IMPACT ASSESSMENT			
Course Code	**PEC-CEEL-306-G**	**External marks:**	**75**
Credits	**3**	**Internal marks:**	**25**
L-T-P	**2-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To know the various types of environmental pollution.
- To understand various EIA techniques.
- To provide adequate knowledge about the noise pollution.
- To have adequate knowledge on various type of sounds.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Introduction Environment: Definition, Scope, Components, Structure and Composition. Environmental Quality, Monitoring and Base Line Data.

Module 2: Sustainable Development

Present and Future Development Needs; Exploitation of Natural Resources, Environmental Harmony, Economic Efficiency and Social Justice, Symbiotic Relationship, Concept of Carrying Capacity

SECTION-B

Module 3: Environmental pollution

Environmental pollution due to increasing growth rate, population and human interaction; Air Pollution: Sources, Effects and its Control Measures; Water Pollution: Point and Non-point Source of Pollution, Major Pollutants of Water, Impact of pollutants and its Control Measures; Noise Pollution: Sources, Effects and its Control Measures

Module 4: Evolution of EIA

Scope, Preliminary Screening Requiring EIA of projects, Impact identification, Assessment of Impact; Impact Evaluation, Types of EIA, rapid and comprehensive, Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air and land, energy, flora and fauna; addressing the issues related to the project affected people

SECTION-C

Module 5: EIA Methodology

Impact Analysis: identification, predication, evaluation; Impact Identification Methods: overlays method, ad-hoc method, Checklist method, Matrices method, Fault Tree Analysis, Event Tree Analysis, Role of an Environmental Engineer,

Module 6: Environmental Audit

Cost Benefit Analysis; Life Cycle Assessment; Resource Balance, Energy Balance, management Review of Environmental Audit; Operational Control;

SECTION-D

Module 7: Case Studies of EIA

Standards for Water, Air and Noise Quality and their indices - Environmental Management Plan, EIA case studies for new and expansion projects: township projects, river valley projects, thermal power plants and industrial plants.

Module 8: Environmental Management

Preventive Policy of Environment, Waste Minimisation, Conservation of Water and Energy, Use of Renewable Sources, Pollution Control Strategy, Disposal of Treated Effluents, Solid Waste Disposal, Concept of Green Cities, Green Belt Development – Case History, Environment Management Plan – ISO 14000

Course Outcomes

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

- Analyze various EIA techniques
- Analyze various types of pollutions.

Reference Books

- Environmental Impact Assessment: Cutting Edge for the 21st Century : Alan Gilpin
- Environmental Impact Assessment : Larry W Canter
- Environmental Impact Assessment: A Methodological Approach : Richard K. Morgan

ADVANCED CONCRETE STRUCTURE			
Course Code	**PEC-CEEL -308-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

At the end of this course, the student should be able to impart understanding of designing specialized RCC structures. To prepare the detailed structural drawings for execution purpose

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION A

Module1: Continuous Beams

Basic Assumptions, Moment of inertia, Settlements, Modification of Moments, Maximum Moments and Shear, Design Examples.

Module2: Curved Beams

Analysis for Torsion, Redistribution of Moments for Single and Multi-Span Beams, Design of Circular Beams Supported on Symmetrically Placed Columns, Semi-Circular Beams Supported on Equally Spaced Column , Design examples.

SECTION B

Module 3: Flat Slab

Advantages of Flat Slab, General Design Considerations, Indian Code Recommendations, Approximate Direct Design Method, Equivalent Frame method, Design of Flat Slabs, Openings in Flat Slab

Module 4: Yield Line Theory

Basic Assumptions, Yield Line Patterns and Failure Mechanisms, Ultimate Load on Slab, Design Example.

SECTION C

Module 5: Liquid Retaining Structure

Design Concepts of Liquid Retaining Structures, Design of Tanks Resting on Ground, Underground Tanks and Overhead Service Reservoirs, Staging and Foundation Design.

Module 6: Stair Case

Various Types of Staircases, General Notes on Design of Stair, Design Examples.

SECTION D

Module 7: Design of Joints

Types of Joints, Joints in Multi-Storied Buildings, Forces Acting on Joints, Design of Joints for Strength, Anchorage Requirement in Joints, Detailing of Reinforcement in Joints.

Module 8: Building Frames

Introduction, Members Stiffness, Torsion in Buildings, Design Loads on Building Frames Including Wind and Earthquake Loads, Earthquake Resistant Design using Software, Introduction to IS: 13920 and Concepts of Ductile Detailing in Building Frames, Design and Detailing for Ductility, Design Examples.

Course Outcomes

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

- Design advanced RCC structures.
- Prepare detailed structural drawings for the designed RCC structures using software.

Reference Books:

- "Advanced Reinforced Concrete Design", P.C. Varghese, Prentice Hall of India Pvt. Ltd.
- "Plain & Reinforced Concrete,"Jain& Jai Krishan (Vol. I & Vol-II), Nem Chand and Bros.
- "Reinforced Concrete Structures", Syal and Goel, S. Chand & Company Pvt. Ltd.
- "Reinforced Concrete Design", S.U. Pillai&Devdas Menon, Tata McGraw Hill.
- "Reinforced Concrete Limit State Design"' A.K. Jain, Nem Chand and Bros.

PRE-STRESSED CONCRETE			
Course Code	**PEC-CEEL-310-G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives

- To introduce the need for prestressing as well as the methods, types and advantages of prestressing to the students.
- Students will be introduced to the design of pre-stressed concrete structures subjected to flexure and shear.
- To make them familiar with design of typical pre-stressed concrete structural elements and to have a knowledge of the codal provisions.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Material Properties and Prestressing Systems

Introduction of Prestressing system- history, types, source, advantages and its limitations, Prestressing Systems and Devices
Materials properties- Constituents of Concrete and their Properties, Stress-Strain Curves for Concrete, Constituents of Prestressing Steel and their Properties, Types of Prestressing Steel, Stress-Strain Curves for Prestressing Steel, Relaxation of Steel, Fatigue, Codal Provisions.

Module 2: Losses in Prestress

Elastic Shortening, Pre-Tensioned & Post-Tensioned - Axial & Bending Members, Losses in Prestress - Friction, Anchorage Slip, Creep of Concrete, Shrinkage of Concrete, Relaxation of Steel, Total Time-Dependent Loss, Force Variation Diagram.

SECTION-B

Module 3: Analysis and Design for Shear and Torsion

Analysis for Shear- Introduction, Types of Cracks, Components of Shear Resistance, Modes of Failure, Effect of Prestressing Force, Stress in an Uncracked Beam, Design and Detailing Requirement for Shear, Design of Transverse Reinforcement.
Analysis for Torsion-Introduction, Crack Pattern Under Pure Torsion, Components of Resistance for Pure Torsion, Modes of Failure, Effect of Prestressing Force for Torsion, Stresses in an Uncracked Beam, Design and Detailing Requirement for Torsion, Design of Longitudinal Reinforcement and Transverse Reinforcement.

Module 4: Calculations of Deflection and Crack Width

Factors Influencing Deflections, Short Term Deflections of Uncracked Members, Prediction of Long Term Deflections due to Creep and Shrinkage, Check for Serviceability Limit State of Deflection. Deflection due to Gravity Loads and Prestressing Force, Total Deflection, Determination of Moment of Inertia, Calculation of Crack Width, Method of Calculation, Limits of Crack Width.

SECTION-C

Module 5: Analysis of Members

Analysis of Members under Axial and Flexural Load- Based on Stress, Force and Load Balancing Concept. Cracking Moment, Kern Point, Pressure Line, Analysis for Ultimate Strength, Variation of Stress in Steel Condition at Ultimate Limit State, Analysis of Rectangular Sections, Flanged Sections, Partially Pre-Stressed Sections, Un-Bonded Post-Tensioned Beams.

Module 6: Design of Members

Design of Members for Axial Tension, Flexure Type I and Type II, Choice of Sections, Determination of Limiting Zone, Post-Tensioning in Stages, Magnel's Graphical Method, Guyon's Method

SECTION-D

Module 7: Composite and Continuous Beams

Analysis and Design of Composite Beams – Methods of Achieving Continuity in Continuous Beams, Analysis for Secondary Moments, Concordant Cable and Linear Transformation, Calculation of Stresses, Principles of Design.

Module 8: Miscellaneous Structures

Design of Tension and Compression Members, Tanks, Pipes and Poles, Partial prestressing – definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

Course Outcomes

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

- Analyse prestressed concrete members
- Design prestressed concrete members using codal provisions
- Design for shear and torsion of prestressed concrete members
- Design end blocks and provide detailing of reinforcements
- Design composite members and other applications
- Design continuous members

Reference Books

- Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
- Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
- Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
- IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards,

REPAIR & REHABILITATION OF STRUCTURE			
Course Code	**PEC-CEEL-312 G**	**External marks:**	**75**
Credits	**4**	**Internal marks:**	**25**
L-T-P	**3-1-0**	**Total marks:**	**100**
		Duration of Examination:	**3 hrs**

Course Objectives:

This course has been designed with an aim to give the students an insight into the subject of concrete repair, its protection and strengthening

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

SECTION-A

Module 1: Introduction

Overview of Distress, Deterioration in Concrete Structures, Global Scenario of Distressed Structures, Need for Repairs and Upgrading of Structures, Process for Durable Concrete Repair

Module 2: Deterioration of concrete structures

Types of Deterioration - causes & symptoms, mechanism & micro-structure of concrete, Physical and Chemical Deterioration and its factors, Deterioration due to Water Leakage, Fire – detection & mitigation, Deterioration due to Ageing and Inadequate Maintenance, Design & Construction Deficiencies like Overloading.

SECTION-B

Module 3: Visual deterioration of structures

Types of Cracks, Causes & Characteristic of Cracking in Various Structural Components, Measurement of Cracks and Interpretation of the Cracking Phenomena

Module 4: Conditional/damage assessment & Evaluation of structures

Structural Assessment- importance, objective, various stages, conditional evaluation of the structure, Damage Assessment Procedure, Preliminary & Detailed Investigation – scope, objectives, methodology & rapid visual inspection of structures , Damage Assessment Allied Tests (Destructive, Semi-Destructive and Non-Destructive), Field & Laboratory Testing Procedures- strength, corrosion activity, performance & Integrity, Durability.

SECTION-C

Module 5: Repairs of concrete structures

Repairing Materials- criteria, selection of repair materials, methodology, performance requirements, preparatory stage of repairs, different types of repair materials & their application and repair techniques

Module 6: Retrofitting/Strengthening

Need for Retrofitting, Design Philosophy of Strengthening Structures, Conventional and Advanced Techniques Available for Strengthening, Seismic Retrofit of Concrete Structures- deficiencies in structure requiring seismic retrofit and its design philosophy, Latest Techniques to Enhance the Seismic Resistance of Structures.

SECTION-D

Module 7: Protection & maintenance of structures

Importance of Protection & Maintenance, Categories of Maintenance, Building Maintenance, Corrosion Mitigation Techniques

Module 8: Structural health monitoring (SHM)

Definition and Motivation for SHM, Basic Components of SHM and its Working Mechanism, SHM as a Tool for Proactive Maintenance of Structures

Course Outcomes

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

- Identify and define all the terms and concepts associated with deterioration of concrete structures.
- Carry out the damage assessment and Rapid Visual inspection of a building showing signs of deterioration and thus should be able to detect the possible cause /source of deterioration.
- Develop a knowhow of the Concrete repair industry equipped with variety of repair materials and techniques.
- Describe and apply the importance of quality control in concrete construction and significance of protection and maintenance of structures.

Reference Books

- Concrete microstructure, Properties and materials – P Kumar Mehta and Paulo J.M.Monterio.
- Handbook on Repairs and Rehabilitation of RCC buildings – CPWD, Government of India.
- Concrete Technology by M.L.Gambhir, Tata McGraw-Hill Education, Third Edition
- V. M. Malhotra, Nicholas J. Carino 2004 “Handbook on Nondestructive Testing of Concrete”
- “Repair and Strengthening of Concrete structures” , FIP guide, Thomas Telford, London.
- Concrete Structures, Protection, Repair and Rehabilitation by R.Dodge Woodson.
- Repairs and rehabilitation of concrete structures by P. I. Modi & C. N. Patel, PHI Publication.

Maharshi Dayanand University, Rohtak

(A State University established under Haryana Act No. XXV of 1975)
(NAAC Accredited 'A^{+}' Grade)

Scheme of Studies and Examination

B.Tech. (Civil Engineering)

7th and 8thSemester

Scheme effective from 2021-22

Course code and definitions:

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional Core Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar
TH	Theory
PROJ	Project

General Notes:

1. Mandatory courses are non-credit courses in which students will be required passing marks in internal assessments.
2. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
3. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.

Scheme of Studies and Examination

B.Tech. (Civil Engineering) – 7th Semester

w.e.f. 2021-22

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	Theory	Practical	Total	
1	Professional Core course	PCC-CE-401G	Construction planning and management	2	1	0	3	3	25	75	-	100	3
2	Professional Core course	PCC-CE-403G	Advanced steel structure	2	1	0	3	3	25	75	-	100	3
3	Professional Core course	PCC-CE-405G	Design of Hydraulic Structures	2	1	0	3	3	25	75	-	100	3
4	Professional Elective course	*	ElectiveIII **(Refer List-I)**	2	1	0	3	3	25	75	-	100	3
5	Professional Elective course	**	Elective IV **(Refer List-II)**	2	1	0	3	3	25	75	-	100	3
6	Professional Elective course	***	Elective V (**Refer List-III)**	2	1	0	3	3	25	75	-	100	3
7	Practical Training	PT-CE-425G	Industrial training viva							**Refer Note 1***			-
8	Project	PROJ-CE-427G	Project work-I	0	0	6	6	3	50		50	100	3
TOTAL								**21**	**200**	**450**	**50**	**700**	

Note:

1. The valuation of Industrial training viva (PT-CE-425G) will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Industrial training.

   Excellent:A;Good:B; Satisfactory: C; Not Satisfactory: F

2. *Choose any one subject from **LIST I.**
3. **Choose any one subject from **LIST II.**
4. ***Choose any one subjectfrom**LIST III.**

ELECTIVE- III (PEC) –LIST I

S.no	Name of course	Code	L-T-P	Credits
1.	Disaster Management and Mitigation	PEC-CEEL – 407 G	2-1-0	3
2.	Environmental Management	PEC-CEEL - 409 G	2-1-0	3
3.	Hydro Power Engineering	PEC-CEEL - 411 G	2-1-0	3

ELECTIVE- IV(PEC) –LIST II

S.no	Name of course	Code	L-T-P	Credits
1.	Ground water engineering	PEC-CEEL - 413 G	2-1-0	3
2.	Watershed Management	PEC-CEEL –415 G	2-1-0	3
3.	River Engineering	PEC-CEEL –417 G	2-1-0	3

ELECTIVE- V(PEC) –LIST III

S.no	Name of course	Code	L-T-P	Credits
1.	Railway and Airport Engineering	PEC-CEEL -419 G	2-1-0	3
2.	Traffic Engineering	PEC-CEEL -421 G	2-1-0	3
3.	Bridge Engineering	PEC-CEEL -423 G	2-1-0	3

Scheme of Studies and Examination
B.Tech. (Civil Engineering)– 8th Semester
w.e.f. 2021-22

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	Theory	Practical	Total	
1	Professional Core course	PCC-CE-402G	Estimation, Costing and Valuation	2	1	0	3	3	25	75	-	100	3
2	Professional Elective course	*	Elective –VI **(Refer List-IV)**	2	1	0	3	3	25	75	-	100	3
3	Professional Elective course	**	Elective –VII **(Refer List-V)**	2	1	0	3	3	25	75	-	100	3
4	Open elective course	***	Open elective-I **(Refer List-VI)**	3	0	0	3	3	25	75	-	100	3
5	Seminar	S-CE-418G	Seminar	0	0	2	2	1	25	-	-	25	-
6	Mandatory courses (non-credit)	MC-317G*	Constitution of India	2	0	0	2	-	**Refer Note 1***				
7	Project	PROJ- CE-420-G	Project work-II	0	0	8	8	4	75		75	150	3
		TOTAL						**17**	**200**	**300**	**75**	**575**	

*__Note: 1. MC-317G__ is a mandatory non-credit course in which the students will be awarded gradesA, B, C, F as per their performance. A: Excellent, B: Good, C: Satisfactory, F: Not Satisfactory.

A student who is awarded 'F' grade is required to repeat course.

2. *Choose any one subject from **LIST IV**
3. **Choose any one subject from **LIST V**
4. ***Choose any one subject from **LIST VI**

ELECTIVE-VI (PEC) –LIST IV

S.no	Name of course	Code	L-T-P	Credits
1.	Ground Improvement Techniques	PEC-CEEL -404G	2-1-0	3
2.	Rock Mechanics	PEC-CEEL -406G	2-1-0	3
3.	Geotechnology	PEC-CEEL -408G	2-1-0	3

ELECTIVE-VII (PEC) –LIST V

S.no	Name of course	Code	L-T-P	Credits
1.	Advanced Structure Analysis	PEC-CEEL - 410G	2-1-0	3
2.	Finite Element Method	PEC-CEEL -412G	2-1-0	3
3.	Structural dynamics	PEC-CEEL -414G	2-1-0	3

OPEN ELECTIVE COURSES -I (OEC) – LIST VI

S.no	Code	Name of course	L-T-P	Credits
1.	OEC-PHY-101G	Material Science	3-0-0	3
2	OEC-CH-401G	Chemistry-II (Chemical Applications)	3-0-0	3
3	OEC –ME-402G	Operation Research	3-0-0	3
4	OEC-ME-410G	Quality Engineering	3-0-0	3
5	OEC –EE-412G	Electrical Power Generation	3-0-0	3
7.	OEC-CE-416G	Solid and Hazardous waste management	3-0-0	3
8	OEC-ECE-451G	Electronic Principles	3-0-0	3
9.	OEC-ECE-452G	Intelligent Instrumentation for Engineers	3-0-0	3
10	OEC-CSE-430G	Computer Communication	3-0-0	3

Course code	**PCC-CE- 401G**				
Category	Professional Core course				
Course title	**Construction Planning and Management**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

At the end of this course, the students should be able:

- To learn the Basic knowledge of construction management, bar/milestone chart,
- To get knowledge of PERT and CPM, CPM (Cost Model).
- To know the construction equipment's and selection of construction equipment's.

Note:
Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit -I

Module 1: Introduction

Project Management, Project Planning, Scheduling, Controlling, Methods of Planning and Programming, Bar Carts and Milestone Charts and Network Methods/Techniques.

Module 2: PERT (Programme evolution and review technique)

Time Estimates, Frequency Distribution, Mean, Variance and Standard Deviation, Probability Distribution, Beta Distribution, Expected Time, Time Computation, Network Analysis and Critical Path.

Unit -II

Module3: CPM (Critical path method)

CPM Networks, Earliest Event Time, Latest Allowable Occurrence Time, Earliest Start time, Earliest Finish Time, Latest Start Time, Latest Finish Time, Float, Critical Activity and Critical Path.

Module 4: CPM (Cost model)

Project Cost, Direct Project Cost, Indirect Project Cost, Total Project Cost and Optimum Duration, Slope of Direct Cost Curve and Steps in Time Cost Optimization.

Unit -III

Module 5: Construction Equipment

Classification of Major Equipment, Earth Excavating Equipment, Earth Cutting and Hauling Equipment, Earth Compacting and Grading Equipment, Concreting Plant and Equipment.

Module 6: Selection of construction equipment

Task Considerations, Cost Considerations, Equipment Engineering Considerations and Equipment Acquisition Options.

Unit -IV

Module 7: CPM (Updating)

Updating Process, Data Required for Updating, Steps in the Process of Updating, When to Update. PPT/BOT Techniques and its variance.

Module8: Resources Allocation

Resource's usage profiles, Histograms, Resources Smoothing, Resources Levelling and Risk associated in construction project Management.

Course Outcomes:

After completing this course, students should be able:

- Proficient enough to apply the concepts of the construction project management with time and cost estimates.
- Different Cost of the Projects with total cost of the Project and selection of construction equipment's

Recommended Book:

1. "Project Planning and Control with CPM/PERT", Dr. B.C. Punmia, Laxmi Publication New Delhi.
2. Construction Project Management", K KCHitkara,Tata McGraw Hills.
3. "Construction Equipments", by Mahesh Verma.
4. Construction Project Management an Integrated Approach", Peter Femings Yes Dec Publishing Pvt. Ltd. Chennai 2011

Course code	**PCC-CE- 403 G**				
Category	Professional Core course				
Course title	**Advanced Steel Structure**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives

- To impart practical knowledge of advanced steel structures and their application.
- To teach the students advance level design of steel structures.
- To make the students familiar with the relevant IS codes to be used in construction industries.
- To teach the students modern design methods such as design of light gauge steel.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module 1: Eccentric and Moment Connections

Beams-Column Connections, Connections Subjected to Eccentric Shear, Bolted Framed Connections, Bolted Seat Connections, Bolted Bracket Connections. Bolted Moment Connections, Welded Framed Connections, Welded Bracket Connections and Moment Resistant Connections.

Module 2: Cold Formed Sections

Brief description of various types of cold-formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, Design of compression and bending elements.

Unit-II

Module 3: Industrial Buildings

Loads, general arrangement and stability, design considerations, design of Purlins, design of roof trusses, industrial building frames, bracings and stepped columns.

Module 4: Towers

Transmission line towers, Microwave towers, Design loads, classification, Design and specification.

Unit-III

Module 5: Design of Water Tanks

Types of water tank, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

Module 6: Design of Steel Stacks

Types of steel stack, various loads consideration of steel stacks, Design of steel stacks including foundation.

Unit-IV

Module 7: Plate Girder

Elements of plate girder, Design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices, Curtailment of flange plates, Design beam to column connections: Introduction, design of framed and seat connection.

Course Outcomes

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

- Apply the IS code of practice for the advanced design of steel structural elements.
- Design complicated structures like plate girder, Industrial structures and tanks.
- Design light gauge structures too.
- Use relevant IS code for above structural design.
- Students will be able to understand the advanced design of steel structure with practical application.

References:

1. Design of steel structures, A.S.Arya&J.L.Ajmani, Nemchand& Bros., Roorkee.
2. Design of steel structures (LSM), N,.Subramanian, Oxford Publication.
3. Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
4. Design of steel structures, S.M.A.Kazmi&S.K.Jindal, Prentice Hall, New Delhi.
5. Design of steel structures, S.K.Duggal, TMH Pub, New Delhi.

Course code	**PCC-CE- 405 G**				
Category	Professional Core course				
Course title	**Design of Hydraulic Structures**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- To understand design processes of hydraulic structures
- To further develop understanding on cross drainage works.
- To further develop understanding on design considerations of Dams
- To develop understanding on seepage conditions.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit- I

Module 1: River training works

Objectives and classifications of river training works, Methods of river training Bends and Meandering rivers, marginal embankments, spurs, cutoffs, bank pitching and launching apron. Design consideration of guide banks.

Module 2: Flood Routing

Flood routing categorization and methods,Basic equations in flood routing, Concept of Hydraulic routing, Hydrologic method of flood routing.

Unit II

Module 3: Design of Cross Drainage Works

Need of cross drainage works and their suitability, Canal regulation structures and design of cross drainage works, canal drops, operation and maintenance of canals.

Module 4: Hydraulic structure

Blight creep and Khosla theory, stream lines, critical exit gradient, need of weirs and barrage, Factors controlling the design of weirs and barrages and its components. Design of weirs.

Unit III

Module 5: Design of Spillways

Need of spillway, Design consideration of main spillway, Design of ogee spillway, crest of spillway and stilling basins.

Module 6: Design of Fall

Location and Necessity of falls, componentsof Sarda type fall and itsdesign, characteristics of sloping glacis falls.

Unit-IV

Module7:Dams

Planning and investigations of reservoir and dam sites, Choice of dams, preparation and protection of foundation and abutments. Dam construction problems, Forces acting on gravitydams, modes of failure and design criteria for structural stability of gravity dams, seepage line in a homogenous earth dam, equipotential lines, path lines, kozeny parabola.

Course Outcomes:

After completing this course, students should be able:
1.To identify the design lines of hydraulic structures
2. To being able to read charts for various designing purposes

Reference Books:

- Garg, S. K., "Irrigation Water Power & Water Resources Engg." Standard Publishers & Distributors, Delhi, latest edition
- Modi, P.N. "Irrigation, Water Resources and Water Power Engg." Standard Book House, N. Delhi latest edition
- Arora, K R "Irrigation Water Power & Water Resources Engg." Standard Publishers & Distributors, Delhi, latest edition
- Sharma, S.K., Principles and Practice of Irrigation Engineering, S.Chand& Co., latest edition
- Punmia, B.C., "Irrigation and Water Power Engg." Standard Publishing.

Course code	**PEC-CEEL- 407G**				
Category	Professional Elective course				
Course title	**Disaster Management and Mitigation**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- To provide basic conceptual understanding of disasters and its relationships with development.
- Provide an understanding of the social nature of natural hazards and disasters
- Increase awareness of hazards and disasters around the world and the unequal social consequences stemming from disaster events.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Introduction: Terminology,Global and Indian scenario, role of engineer, importance of study in human life, long term effects of disaster. Geological Mass Movement and land disasters, Atmospheric disasters, Disaster Mitigation

Unit-II

Nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion, Man-made Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

Unit -III

Damage profile analysis- Uttarkashi/Bhuj/Latur earthquakes, Kerala floods, cyclone Fani and Amphan, Bihar floods, Covid 19, Forest Related disasters, Mining disasters, Atmospheric disasters.

Unit IV

Importance of public awareness, Preparation and execution of emergency management programme. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Use of Internet and software for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.

Course Outcomes:

After completing this course, students should be able:

- To know natural as well as manmade disaster and their extent and possible effects on the economy.
- To Plan national importance structures based upon the previous history.
- To acquaint with government policies, acts and various organizational structures associated with an emergency.
- To know the simple dos and don'ts in such extreme events and act accordingly.

Reference Books:

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

Course code	**PEC-CEEL- 409G**				
Category	Professional Elective course				
Course title	**Environmental Management**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:
The course should enable the students to:

- Global environmental issues and their Management.
- Green technologies for cleaner production.
- Major principles and steps required in environmental impact assessment.
- Causes of land degradation, biodiversity loss and methods of their management.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

UNIT-I

Global Environmental Problems: Global warming, green-house effect, ozone depletion, acid rain, oil pollution, radiation hazard and control, global climate change. Main clauses and basic steps for Environmental Management System certification. Environmental Laws/Acts.

UNIT-II

Cleaner Production Technologies Need and benefits, cleaner production techniques and options, zero impact manufacturing initiatives CDM and carbon credits/case studies.

UNIT-III

Environment Impact Assessment: Importance for environment management, constituents of environment impact assessment, project data for EIA study, prediction of impacts, EIA methodologies, constraints in implementation of EIA, impact prediction on water resources projects and other relevant case studies. Environment pollution.

UNIT-IV

Degradation of Land Resources: Deforestation: Forest land, deforestation and its effects onland use and Environmental quality, wetland and their importance in environment, causes and extent of wasteland, Soil degradation problems, erosion, salinization, water logging, land use management & planning.

Course Outcomes:

- An ability to understand the major global environmental issues, their causes, sources, management and laws/polices related to these technologies involved in eco-friendly production and mechanism of carbon credits.
- An ability to understand the major principles of environmental impact assessment.
- An ability to understand the implications of current rules and regulations in relation to environmental impact assessment.
- An ability to understand the causes, implications and management of local environmental issues like land degradation, wasteland and water logging.

Recommended Books:

1. Peavy, Rowe, 'Techobanoglous, Environmental Engg.' Tata McGraw Hill.

2. Mackenzie L. Davis, 'Environmental Engg.' Tata McGraw Hill.

3. Baljeet S. Kapoor; 'Environmental Engg. An overview', Khanna Publishers.

4. Glbert H. Masters, 'Environmental Engineering and Science', Prentice Hall of India Pvt. Ltd.

5. G.N. Panday, G.C. Carney Environmental Engineering, Tata McGraw Hill.

6. P.D. Sharma, Ecology and Environment, Rastogi Publications.

Course code	**PEC-CEEL- 411 G**				
Category	Professional Elective course				
Course title	**Hydro Power Engineering**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives

The objective of this Course is

- To introduce energy systems and renewable energy resources with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.
- To explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources.
- To introduce basicsof turbine and powerhouse.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module 1: Introduction to Energy Sources

Sources of energy, Status of hydropower, thermal vs hydropower, advantages of hydropower, Energy contribution of hydropower in power system.

Module 2: Basics of Hydropower

Electrical load on hydropower, load curves, load factor, capacity factors, utility factors anddiversityfactors, load on hydropower stations, load curves, load duration curves, firm power, secondary power, Prediction of loads.

Unit-II

Module 3: Types of Hydropower Stations

Elements of Hydro power, classification of hydropower stations, run of river plants, General layout of run of river plants, Valley dam plants, storage and pondage.

Module 4: Basic features of Pump Storage Plants

Advantages of pump storage plants, types of pump storage plants, efficiency of pump storage plants, Reversible Turbines.

Unit-III

Module 5: Intakes

Intake structures: functions and their types, Components of intakes: forebay, trash racks, gates and valves, Force required to operate Gates.

Module 6: Water Conveyance System

Classifications of Penstocks, Design criteria of penstocks, anchor blocks, typesof valves, water hammer effects, instantaneous closure of power canal, Surge tank and its classification.

Unit-IV

Module 7: Turbines

Type of turbines, criteria for selection, specific speed of turbines, unit power, unit discharge, cavitation in turbines, Design of the draft tube.

Module 8: Power Houses

General layout and arrangements of hydro-power units, number and size of units, substructure, spacing of units, super-structure, underground power stations.

Course Outcomes:

At the end of the course, students will be able to learn

- Different energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.
- Explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources.
- Basics of turbine and powerhouse.

References:

- Water power Engineering by Dandekar and Sharma.
- Hydropower structures Volume III-By R S Varshney.
- Hydro Power Engineering by Dr Darde P N, Vayu Education,Delhi.
- Hydro-Electric Engineering Practice Vol.I, II& III Brown J.G.
- Water Power Engineering, Borrows, H.K.
- Water Power Development, Vol.I& II, Mosonyi,E.
- Water Power Engineering, M.M.Deshmukh.

Course code	**PEC-CEEL- 413G**				
Category	Professional elective course				
Course title	**Ground Water Engineering**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

1. To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers.
2. To understand the techniques of development and management of groundwater.
3. Some real- world example problems are also been incorporated to give an idea about the complexities and challenges encountered during the management of groundwater processes.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module 1: Hydrogeological Parameters

Ground water exploration and methods of investigations, Characteristics of ground water, forms of subsurface water, Global distribution of water, groundwater column, Ground water table fluctuation and its interpretations, Groundwater development and Potential in India, Groundwater balance.

Module 2: Groundwater Management

Database for Groundwater Management, Groundwater budgets, Water bearing formations of Rock and their properties, safe yield, Type of aquifers, Darcy's Law, Aquifer properties.

Unit-II

Module 3: Well Hydraulics

Objectives of Groundwater hydraulics, Governing equation for flow through porous medium - Steady flow, Dupuit assumptions, equilibrium equations for confined and unconfined aquifers, Heim's equilibrium formula.

Module 4: Unsteady State Flow

Governing equation for flow through porous medium - unsteady state flow – Jacob method – Chow method- Recovery test-pumping tests, Conjunctive use – Collector well and Infiltration gallery, well loss coefficient, Partially penetrating wells - Wells in a leaky confined aquifer, interference of wells.

Unit-III

Module 5: Water Withdrawals and Uses– water for energy production, water for agriculture, water for hydroelectric generation; flood control, analysis of surface water supply, open wells in unconsolidated formations, sanitary protection of open wells.

Module 6: Tube well

Tube wells types, site selection, components, strains and its types, design of tube wells in different aquifers, drilling operation and its different methods, Construction and working of tube wells, verticality and alignment, development of tube wells, gravel packing, well sickness, corrosion and failure of tube wells, silting of tube well, optimum capacity of well.

Unit-IV

Module 7:Groundwater Conservation

Reclaimed wastewater recharge, Soil aquifer treatment, Aquifer Storage and Recovery, Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use, Contamination source inventory and remediation schemes.

Module 8: Artificial Recharge

Artificial recharge of ground water, recharge techniques induced infiltration, water spreading, flooding, basins, ditching, modification of natural channels, irrigation, recharge pits, shafts, Hydraulics of recharge wells.

Course Outcomes: The students will be able to**.**

- Understand aquifer properties and its dynamics.
- Get an exposure towards well design and practical problems of groundwater aquifers.
- To understand the importance of artificial recharge and groundwater quality concepts.
- Gain knowledge on conservation of groundwater.
- Understand different tube wells and their components.

Recommended Books:

- Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
- Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.
- S.P. Garg, Groundwater and Tube Wells, Oxford & IBH Publishing Co., 1993.
- Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.

Course code	**PEC-CEEL- 415G**				
Category	Professional Elective course				
Course title	**Watershed Management**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- To understand different watershed behaviour.
- To be able to interpret runoff data and quantify erosion by using various modelling methods.
- To understand land use classification and impact of land use changes on hydrological cycle parameters.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Introduction and Basic Concepts: Concept of watershed, need for watershed management, different stakeholders and their relative importance, watershed management policies and decision making. Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation; Principles of soil erosion- causes and types of soil erosion,estimation of soil erosion from small watersheds. Control of soil erosion, methods of soil conservation-structural and non-structural measures.

Unit-II

Integrated Watershed Management: Introduction to integrated approach, Integrated water resources management, conjunctive use of water resources, rainwater harvesting; roof catchment system. Watershed Modeling: Standard modeling approaches and classifications, system concept for watershed modeling, overall description of different hydrologic processes, modeling of rainfall-runoff process, subsurface flows and groundwater flow.

Unit-III

Social Aspects of Watershed Management: Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies. Use of modern techniques in watershed management: Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management.

Unit-IV

Storm Water, Flood and Drought Management: Storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation, case studies on flood damage. Drought Management: Drought assessment and classification, drought analysis techniques, drought mitigation planning.

Course Outcomes:

At the end of the course, students shall be able:

1. To identify causes of soil erosion.
2. Plan and design of soil conservation measures in a watershed.
3. Plan and design water harvesting and groundwater recharge structures.
4. Plan measures for reclamation of saline soils.

Reference:

1. Murthy, V.V.N. and M.K. Jha Land and Water Management, Kalyani Publishers, 2015
2. Watershed Management by Madan Mohan Das and M.D. Saikia, Prentice Hall of India, 2013
3. Watershed Management Muthy, J. V. S., , New Age International Publishers, 1998

Course code	**PEC-CEEL- 417 G**				
Category	Professional Elective course				
Course title	**River Engineering**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	**0**	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- Acquaint the students to basic concepts of rivers and their significance.
- To stimulate the students to think systematically and objectively about contemporary river problems.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Introduction: classification of streams, sediment transport and budgets, River morphology and various classification schemes. River basins; erosion from river catchments and its transportation by rivers; Regimes of Flow: Ripple and dune regime, anti-dune regime, importance of regimes of flow, Bed Load Transport:Bedload equations.

Unit-II

Behaviour of Rivers: River channel patterns, Straight River channels, causes, characteristicsand shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Delta formation and control.

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics ofstream restoration. Bio-engineering techniques, Classification review, Natural channel design analysis, Time series, Analysisof flow, Sediment and channel geometry data.

Unit IV

Rivertraining and protection works: Classification of River training, Types of training works, Protection for bridges with reduced waterway, Design of guide bank, Embankment andspurs, other river/flood protection work.

Course Outcomes:

After completing this course, students should be able:

- To realize the significance of river engineering in today life.
- To understand the processes involved in Bio-engineering Techniques.
- To appreciate the role of River Training and Protection Works

Recommended Books:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson.
4. Principles of River Engineering by (The non-tidel alluvial) PH Jameen.

Course code	**PEC-CEEL- 419 G**				
Category	Professional elective course				
Course title	**Railway and Airport Engineering**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

At the end of this course, the student should be able:

- To impart understanding about the various types of railways,
- To classify different tunnels and its techniques of excavation.
- To understand airport engineering.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module–1: Development of railways in India, Permanent way and railway track components, different gauges in India, conning of wheels, function and types of rails, rail sections, defects in rails, creep of rails, rail joints and welding of rails, sleepers – types, spacing and density, rail fixtures and fastenings, ballast, sub-grade and embankment.

Module–2: Geometric design of railway track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves.

Unit-II

Module– 3: Railway traction and track resistance, stresses in railway track, rails, sleepers, ballast. Points and crossings-turnouts, switches, crossings. Track junctions- types, splits, diamond, gauntlet, scissorcrossovers.

Module– 4: Railway stations: Requirements, classifications, platforms, loops, sidings. Railway yards – types, required equipments in yards. Signaling and control system – objectives, classification, Interlocking of signals and points.

Unit-III

Module–5: Railway track - construction, drainage, maintenance. Recent developments in railways – high speed trains, modernization in track for high speed, Metro rails, Monorail, automation in operation and control, Safety in railways – accidents and remedial measures.

Module–6: Tunnels- Site selection, Classification, Size and shape of a tunnels, Methods and techniques of underground excavation in tunnels, Alignment of a Tunnel, Mucking, Lighting and Ventilation in tunnel, Drainage of tunnels, Safety in tunnel construction.

Unit-IV

Module–7: Airport Classification on the basic of community size, types of services, Aircraft Characterizes, selection of site and factors affecting site selection of airport, Airport layout plan.

Module–8: Geometric design of Runways, Airport capacity, factors effecting runway capacity, Airport markings and lightings.

Course Outcomes:

After completing this course, students should be able:

- To realize the significance of Railways and tunnels in today life.
- To understand the processes involved in railway and tunnel maintenance.
- To realize the significance of Airports in today life.
- To understand the processes involved design of airports

Recommended Books:

1. Highway Engineering – S.K.Khanna&C.J.Justo, Nemchand& Bros., 7th Edition (2000).
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali&Dr.N.B.Lal – Khanna publishers – (2003).
3. G.V. Rao Airport Engineering, Tata McGraw Hill Pub. Co., New Delhi
4. Airport Engineering Planning and design, Subhash C. Saxena

Course code	**PEC-CEEL- 421 G**				
Category	Professional elective course				
Course title	**Traffic Engineering**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- Acquaint the students to basic concepts of Traffic and their significance.
- To stimulate the students to think systematically and objectively about various traffic problems

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Traffic Characteristics: Importance of traffic characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India. Effects of traffic characteristics on various design elements of the road.

TrafficStudies: Traffic volume study, speed study and origin and destination study. Speed and delay study. Use of photographic techniques in traffic surveys.

Unit-II

Traffic Accidents: Accident surveys. Causes of road accidents and preventive measures, Capacity and Level of Service: Fundamental diagram of traffic flow, Relationship between speed, volume and density, Level of service, PCU, Design service volume, Capacity of non-urban roads. IRC recommendations, Brief review of capacity of urban roads.

Unit-III

Traffic Control Devices: Signs, Signals, markings and islands. Types of signs, Types of signals, Design of Signal, Intersections at grade and grade separated intersections. Types of grades separatedintersections, Parkingsurveys: On street parking, off street parking.

Unit-IV

Road safety audit, RSA team, RSA Report, Elements of RSA, Detrimental effects of traffic. Vehicular air pollution and Situation in India, Motor vehicle act, Vehicular emission norms in India and abroad. Alternate fuels. Factors affecting fuel consumption.

Course Outcomes:

After completing this course, students should be able:

- To realize the significance of traffic engineering in today life.
- To understand the processes involved in traffic studies.
- To appreciate the role of Traffic regulations.

Recommended Books:

- Principles of Transportation Engineering by Chakroborty& Das, Prentice Hall, India.
- Highway Engg by S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.
- Traffic Engg and Transport Planning by L.R.Kadiyali, Khanna Publishers, Delhi.
- Principles of Transportation and Highway Engineering by G.V.Rao, Tata McGraw-HillPublishingCo. Ltd. N.Delhi.

Course code	**PEC-CEEL- 423 G**				
Category	Professional elective course				
Course title	**Bridge Engineering**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives

- To understand the load-carrying capacity of various types of bridges, upon learning the structural responses to different kinds of loads.
- To design short and medium span bridges, with confidence using existing codes of practice, taking into account of the structural strength, service life and durability.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module 1: Introduction

Component and classification of bridge, Historical bridges (in India and overseas), short history of bridge development, importance of bridge Investigation: Need for investigations, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above HFL, scour depth, choice of bridge type. Site selection-Soil Exploration for site importance of Hydraulic factors in Bridge Design.

Module 2: Planning and layout of bridges

Hydraulic design - Geological and geotechnical considerations, Standard Specifications: For road bridges, I.R.C. loadings and code provisions for standard specifications. Railway bridges, Railway bridge code. General arrangement drawing. Design aids using computer software systems.

Unit-II

Module 3:Concrete bridges

Bridge deck and approach slabs, Slab design methods, Design of bridge deck systems, Slab-beam systems (Guyon-Massonet and Hendry Jaeger methods), Box girder systems- analysis, design and detailing.

Module 4: Steel and composite bridges

Advantages and disadvantages, Orthotropic decks, Box girders, Composite steel-concrete bridges, Truss bridges- analysis and design.

Unit-III

Module 5: Sub-structure

Piers, Columns and towers,Caissons, Abutments and retaining walls, Analysis and design - Shallow and deep foundations

Module 6: Bridge appurtenances

Expansion joints, Design of joints, Types and functions of bearings, Design of elastomeric bearings, Railings, Drainage system and lighting.

Unit-IV

Module 7: Long span bridges

Design principles of continuous box girders, Curved and skew bridges, Cable stayed and suspension bridges, Seismic resistant design, Seismic isolation and damping devices.

Module 8: Construction techniques

Cast in-situ, Prefabricated, Incremental launching, Free cantilever construction, Inspection, Maintenance and rehabilitation, Current design and construction practices.

Course Outcomes:

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

- Understand the fundamentals and codes of practice of bridge design.
- Design the bridge deck and box girder systems using appropriate method.
- Devise the steel truss and composite steel-concrete bridges.
- Propose the sub-structure components such as pier, abutments and bridge bearings.
- Design the various types of long span bridges, curved and skew bridges.

Referenced Books:

1. Krishna and Raju “Bridge Engineering”.
2. Wai-Fah Chen Lian Duan, "Bridge Engineering Handbook", CRC Press, USA, 2000.
3. R.M. Barker and J.A. Puckett, “Design of Highway Bridges”, John Wiley & Sons, New York, 1997.
4. P.P. Xanthakos, "Theory and Design of Bridges", John Wiley & Sons, New York, 1994.
5. D.J. Victor, “Essentials of Bridge Engineering,” Oxford & IBH Publishing, New Delhi, 2001.

Course code	**PROJ- CE-427G**				
Category	Project				
Course title	**Project Work –I**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	0	**0**	**6**	**3**	
External marks:	50 Marks				
Internal marks:	50 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

The object of Project Work I is to start the project work early in the seventh semester and enable the student to take up investigative study in the broad field of Civil Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or in a group, under the guidance of a supervisor. This is expected to provide a good initiationfor the student(s) in R&D work.
The assignment to normally include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/ Modelling/ Simulation/ Experiment/ Design/ Feasibility;
4. Preparing a Written Report on the Study conducted for presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental committee.
6. Preparing a review paper forpresentation/Publication in national conference/ International conference/ Journals, if possible.

Course code	**PCC-CE- 402 G**				
Category	Professional Core course				
Course title	**Estimation, Costing and Valuation**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 7th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives: The objective of this Course is

- To analyze cost/revenue data and carry out make economic analyses in the decision-making process to justify or reject alternatives/projects on an economic basis.
- Prepare engineering students to obtain professional licensure.
- To function in the business and management side of professional engineering practice.
- To preparation estimate of the civil engineering works.
- To preparation specification of construction items.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module 1: Introduction

Purpose of estimating and valuation, Principle of estimation, unit of measurement, item work, Different kinds of estimates,Different methods of estimation.Introduction to estimates of other Civil engineering structures.

Module 2: Building Estimate

Estimation of quantity of load bearing structure with single room & two rooms,Estimation of quantity single storied residential building. Estimation of materials in multi-storey buildings with different sections of walls, foundation, floors and roofs, reinforced brick work, R.C.C works, finishing works and Lump sum items, Estimates of canals, dams, barrages and other structures.

Unit-II

Module 3: Specification

Objectives and Necessity of specification,Types of specification, General specification, Specification ofdifferent construction materials, Specification as per building

classification,Language of specific writing.Specification of Works:Detailed specification for earthworks, cement, concrete, brickwork, flooring, D.P.C, R.C.C, cement plastering, painting and other finishing.

Module 4:Market Survey

Traditional and modular materials, Market survey of construction materials, Wages of labour, Tool's plant and equipment of construction.

Unit-III

Module 5: Rate Analysis

Prerequisites, factors affecting rate analysis, over head expenses, Procedure for rate analysis: schedule of rates, labour requirement for different works, material requirement for different works, Rate analysis of different Items of work (Earth work, Concrete works, R.C.C works, Reinforce Brick work, plastering, painting, finishing).

Module 6:Abstracting and Billing

Purpose of abstract, preparation of abstract, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction. Billing – maintenance of muster roll,record of bills, vouchers and receipt book

Unit-IV

Module 7: Tendersand Contracts

Tender notice and documents, acceptance of tender, Earnest money, security money, retention money, Contract-contractor: terms and conditions of contract, Agreement, Form of Contract, Responsibility of owner, Architect, Contractor and Engineer.Preparation of pay bill, measurement of work for payment of contractors, different types of payment – first &final, running advance and final payment.

Module 8: Valuation

Purpose of valuation, principles of valuation,Types of property, Depreciation, Sinking fund, Lease hold and free hold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and year's purchase. valuation of a building – cost method, rental – return method.

Course Outcomes:

At the end of the course, students shall be able:

- To understand the methodology of Cost-driven design optimization.
- To get understanding of contract models, contract plans and specifications.
- The students will learn the purpose and importance of valuation

Referenced Books:

1. Dutta BN – Estimating &costing.
2. Chakraborty – Estimate costing &specification in civil engg.
3. Kohli &kohli – Atext book on estimating &costing (Civil) with drawings Ambala ramesh Publications.

Course code	**PEC-CEEL- 404 G**				
Category	Professional Elective course				
Course title	**Ground Improvement Techniques**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

At the end of this course, the students should be able:

- To various problems associated with soil deposits and methods to evaluate them.
- To improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.
- To impart fundamental knowledge of Ground Improvement Techniques
- To make capable of choosing and designing the appropriate method of Ground Improvement according to site conditions and requirement.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Module 1:Introduction to Ground Improvement

Definitions, Objectives of soil improvement, Classification of ground improvement techniques, considerations in the selection of the best soil improvement technique.

Module 2: Mechanical Modification

Objectives, Classification of ground modification techniques, Principle of modification for various types of soils, Soil distribution of India-Reclaimed soils.

Unit-II

Module 3: Drainage & Preloading- Drainage of slopes, Pre-loading, Assessment of ground condition for preloading, Vertical drains, Pre-loading with sand drains, Fabric drains, Wick drains, theories of sand drain, Electro kinetic dewatering

Module 4: Hydraulic Modification-Objectives,Principle and Techniques, Gravity drain,Lowering of water table, Methods of dewatering- open sumps and ditches, Single and multi-stage well point systems, Deep wells, Vacuum and electro-osmosis methods. Discharge equations, Stabilization by thermal and freezing techniques.

Unit-III

Module 5: Chemical Modification-Objectives, Effects and Methods, Techniques - sandwich technique, Granular and chemical admixtures, Cement stabilization; Criteria for cement stabilization, Lime stabilization, other chemicals, Bitumen, Tar or asphalt in stabilization, Stabilization using Fly ash

Module 6: Grouting- Grouting and its effects, Groutability and grouting materials, Suspension and solution grouts, Compaction grouting, Jet grouting, Injection methods,Grouting procedure and grout monitoring, Applications of grouting.

Unit-IV

Module 7 Earth Reinforcement-I

Stone columns, Lime Piles-Functions, Methods of installation,Estimation of load carrying capacity and settlement; Soil nailing-construction sequence, Analysis of nailed soil, Methods of installation, Ground Anchors– applications, types and components, Anchor tests.

Module 8 Earth Reinforcement-II

Principles and basic mechanism of reinforced earth, Simple design, Synthetic and natural fiberbasedGeotextilesand their applications, Filtration, Drainage,Separation and erosion control.

Course Outcomes:

On completion of the course the students will be able to

- Acquire about various techniques of ground improvement
- Knowledge about types of chemical stabilization and their construction method
- Techniques to utilise native soil for construction activities
- To identify and evaluate the deficiencies in soil deposits and capable of providing alternative methods to improve its quality.

Recommended Books:

1. Pappala, A.J., Huang,J., Han, J., and Hoyos, L.R., "Ground Improvement and Geosynthetics; Geotechnical special publication No.207, Geo Institute, ASCE, 2010.
2. Cox, B.R., and Grifiths S.C., "Practical Recommendation for Evaluation and mitigation of Soil Liquefaction" in Arkansas, (Project Report), 2010.
3. Day, R.W., "Foundation Engineering Handbook, McGraw – Hill Companies, Inc. 2006.
4. Rowe, R.K., "Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic Publishers, 2001.

Course code	**PEC-CEEL- 406G**				
Category	Professional elective course				
Course title	**Rock Mechanics**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- To classify rocks and to understand stares-strain characteristics,
- To study the failure criteria, and influence of in-situ stress in the stability of various structures and various technique to improve the in-situ strength of rocks.
- Explain Pressure arch theory on different openings.
- Explain Creep, Convergence, Rock burst & Coal bumps.
- Describe the governing factors& protective measures against subsidence.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Module 1: Importance of rock mechanics

History of Rock Mechanics, Distribution of rocks- Archean Rocks, Cuddapah Rocks, Vindhyan Rocks, Palaeozoick Rocks, Mesozoic rocks, Gondwana Rocks, Deccan Traps, Steriographic presentation of Geological data.

Module 2: Engineering Classification of Rock

Terzaghi's rock load classification, Deere Miller, CMRS and RSR System. Index properties and classification of rock masses, Competent and incompetent rock, Rock discontinuity qualitative description, RQD, RMR system.

Unit-II

Module 3: Strength of Rocks

Behaviour of rock under hydrostatic compression and deviatric loading - Modes of rockfailure, Factors influencing rock behaviour, Strength criteria for Isotropic Intact Rocks, Modulus of Isotropic Intact Rocks, Mohr - Coulomb failure criterion stress strain models.

Module 4: Stability of Rock Slopes

Rock slopes - role of discontinuities in slope failure, Modes of failure – Rotational, Plane and wedge failures, Plane failure method of analysis, Wedge method of analysis, Toppling failure, Remedial measures and protection against slope failure.

Unit-III

Module 5:In-situ Stresses in Rocks and Laboratory Tests on Rocks

Stress distribution in rocks, In-situ stresses and their measurements, Hydraulic fracturing, Flat jack, Over coring and under coring methods - stress around underground excavations; Tests for physical properties, Compressive strength, Tensile strength.

Module 6: Field Tests on Rocks and Rock Mass

Geophysical methods seismic refraction method, Electrical resistivity method, Deformability tests– Plate jack test, Goodman jack test, Field shear test, Field permeability test, Open end test, and packerstest.

Unit-IV

Module 7: Rock Foundation

Drilling, Blasting and underground open excavation, Criteria for design of underground excavations and ribs support multiple excavations, Estimation of bearing capacity- factor of safety, Settlement in rocks.

Module 8: Rock Reinforcement

Intact, Fractured rocks,Reinforcement of fractured and joined rocks - shotcreting, bolting, anchoring, rock bolting, grouting and other methods, Rock grouting installation methods.

Course Outcomes:

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

1. Define Rock mechanics & explain its importance.
2. Explain engineering Classification of rock masses (by deer &miller).
3. Describe procedure for collecting of samples, its preparation as specimen.
4. Explain different tests for measuring rock strengths.
5. Explain objectives & methods of rock exploration.

Recommended Books

1. Goodman, R.E., Introduction to rock mechanics, John Willey and Sons, 1989.
2. Hudson, A. and Harrison, P., Engineering Rock mechanics – An introduction to the principles, Pergamon publications, 1997.
3. T. Ramamurthy, Editor, Engineering in Rocks for Slopes Foundations and Tunnels, PHI Learning Pvt. Ltd., 2007

Course code	**PEC-CEEL- 408 G**				
Category	Professional elective course				
Course title	**Geotechnology**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- To emphasize the importance of soil investigations.
- To provide the knowledge for slope stability
- To identify factors controlling stability analysis for different soil
- To understand different types of bracings and sheet piles
- To identify different parameters for improving the soil.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Stability of slopes, factors affecting slope stability, Causes of failure, factors of safety in the basis of different parameters, stability analysis of slopes-total stress analysis, effective stress analysis.
Stability of infinite slopes types of failures of finite slopes, analysis of finite slopes-mass procedure, method of slices, friction circle method, Fellinius method to locate centre of most critical slip circle, Taylor's stability number.

Unit-II

Braced Cuts, sheeting and bracing for deep excavation, movements associated with sheeting, and bracing, modes of failure of braced cuts, pressure distribution behind sheeting.
Cofferdams, types of cofferdams, design and lateral stability of braced cofferdams, design data for Cellular cofferdams, stability analysis of cellular cofferdams on soil and rock.

Unit-III

Cantilever Sheet Piles Purpose of sheet piles, cantilever sheet piles, depth of embedment in granular soils-rigorous method Simplified procedure, cantilever sheet pile penetrating clay.
Anchored Bulkheads Methods of design, free earth support method in cohesionless and cohesive soils, fixed earth support method in cohesionless soils-Equivalent beam method.

Unit-IV

Soil Stabilization, soil improvement, shallow compaction, mechanical treatment, lime stabilization, cement stabilization, dynamic compaction and consolidation, bituminous stabilization, pre-compression, grouting, reinforced earth.
Machine Foundations-necessity, Terminology, characteristics elements of a vibratory system, criteria for satisfactory action of a machine foundation, degree of freedom of a block foundation, Barken's soil spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

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

- To understand the importance of stability analysis for different slopes.
- To assess different bracing system for supporting the soil
- To improve bearing capacity using soil stabilization
- To describe different elements of machine foundations.

Reference Books

- Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publications Pvt. Ltd., New Delhi, 1995.
- Gopal Ranjan, ASR Rao, Basic and Applied Soil Mechanics, New Age Intetrnational Ltd. Publishers- N.Delhi, Edition No. - 3rd, 2016.
- Nainan P Kurian, Design of foundation Systems Principles and Practices, Narosa, 2011
- Donald P. Coduto, Man-Chu Ronald Yeung and William A. Kitch, Geotechnical Engineering, Principles and Practices, PHI Learning Private limited, 2011.
- Basic and Applied Soil Mechanics by Gopal Ranjan and ASR Rao, NewageInt.Pub.
- Soil Dynamic by Shamsher Prakash, McGraw Hill.
- Soil Mechanics & Foundation Engineering by Bharat Singh, Shamsher Prakash, Nem Chand & Bros, Roorkee.

Course code	**PEC-CEEL- 410 G**				
Category	Professional elective course				
Course title	**Advanced Structure Analysis**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

At the end of this course, the student should be able to impart understanding about the advanced structures and its analysis.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module –1: Review of basic structural analysis.

Review of work and energy Principles, Maxwell-Betti's and Castiglano'stheorem, Principle of virtual work, Degrees offFreedom, Static and Kinematic Indeterminacy.

Unit-II

Module –2: Matrix approach to flexibility method

Development of flexibility matrices for beam, 2D frame, Grid and truss elements, Analysis of 2D frames, Trusses and grids.

Module-3: Matrix approach to stiffness method

Development of stiffness matrices for beam, 2D frame, Grid and truss elements, Transformation of coordinates, Element load vector, Assembly of global stiffness matrix and load vector, Analysis of 2D frames, Trusses and grids.

Unit-III

Module-4: Partially discontinuous structures

Partial discontinuities in a member, Development of stiffness matrices for members with Partially discontinuity, Analysis of partially discontinuous beams.

Module-5: Methods of Sub-Structure Analysis and Stresses

Structure analysis using sub-structure technique, Effects of axial forces on flexural stiffness.

Unit-IV

Module-6: Beams Curved in Plan

Forces developed at a section of curved beam, Torsion factor, Analysis of beam curved in plan, Semi- circular beam fixed at two ends subjected to concentrated load and UDL.

Module-7: Computer Programs for Matrix Structural Analysis

Course Outcomes:

By the end of this course the student will be able to:

- Analysis structures using advanced methods of analysis.
- Apply this knowledge for the design of various civil engineering structures using software.

Recommendedbook:

1. "Matrix Analysis of Structures", Gere & Weaver, CBS Publishers and Distributors, Delhi-110032.
2. "Structural analysis", T.S. Thandavamoorthy, Oxford University Press.
3. "Concepts and applications of finite element analysis" Robert D. Cook, Wiley India Pvt. Ltd.
4. "Advanced Structural Analysis", Ashok K. Jain, Nem Chand and Bros., Roorkee.
5. H. C. Martin, "Introduction to Matrix Methods of Structural Analysis." McGraw Hill.
6. Amin Ghali, Adam Neville, Tom G. Brown "Structural Analysis: A Unified Classical and Matrix Approach," CRC Press.

Course code	**PEC-CEEL- 412 G**				
Category	Professional elective course				
Course title	**Finite Element Method**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

The objective of this course is to enrich the student's knowledge about the FEM as applied to one- and two-dimensional problems of engineering and applied science.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module-I: Introduction: Field conditions, Boundary conditions, Functional approximation, Finitedifferences method, Development of finite element method.

Module-2: Element Properties: Displacement models, Relation between the nodal degrees of freedom and generalized coordinates, Convergence requirements, Natural co-ordinate systems, Shape functions, Element strains and stresses, Development of element stiffness, Matrix and equivalent nodal loads, Static condensation.

Unit-II

Module-3: Isoparametric Elements: Isoparametric, Super-parametric and sub-paramatric elements, Computation of stiffness matrix of isoparametric elements, Convergence criteria for isoparametric elements, Numerical integration technique using Gauss Quadrature.

Module-4: One Dimensional Element: Truss element, Analysis of plane truss problem, Hermitian beam element, Beam on elastic foundation and solution of beam problem.

Unit-III

Module-5: Plane Stress and Plane Strain Analysis: Triangular elements, Rectangular elements, Isoparametric elements, Patch test and axisymmetric solid element.

Module-6: Plane Bending Analysis: Displacement functions, Plate bending elements, Reducedintegration, Stress smoothing technique.

Unit-IV

Module-7: Direct Stiffness Method of Analysis and Solution Technique: Assemblage of elements, Direct stiffness method, Boundary conditions and reactions, Gauss elimination and Matrix decomposition.

Module- 8: Finite Element Analysis Software: Pre-and Post-processors finite element analysis software, Error estimates and adaptive meshing.

Course Outcomes:

After completing this course, students should be able:

- Analysis structures using advanced methods of analysis.
- Apply this knowledge for the design of various civil engineering structures using software.

Recommended Book:

1. Krishnamurthy, C.S.,'Finite Element Analysis-Theory and Programming', TMH Pub.N.Delhi.
2. Cook, R.D.,Malkus,D.S. and Plesha,M.E.,'Concept and Applications of Finite Element Analysis', John Wiley & Sons, New York.
3. Desai, C.S. and Abel,J.F.,'Introduction to the Finite Element Method', Affiliated EastWest Press Pvt.Ltd.N.Delhi.
4. ManickaSelvam,V.K.,'Finite Element Primer', Dhan.

Course code	**PEC-CEEL- 414 G**				
Category	Professional elective course				
Course title	**Structural Dynamics**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	2	**1**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives

The objective of the course is to understand the behaviour of structure especially building to various dynamic loads: such as wind, earthquake, machine vibration and ambient vibration.

- Introduce fundamentals of vibrations of SDOF system.
- Introduce damped and undamped system.
- Introduce free and forced vibration.
- Introduced free and forced vibration of MDOF system.
- Introduced free and forced vibration of continuous system

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module 1: Introduction

Importance of structural dynamics, Difference between static loading and dynamic loading, brief history of vibration, Terminology, Sources of vibration, types of excitations, Principle and working of piezoelectric transducers, Spring action and damping; Degrees of freedom; Application of Newton's laws, D'Alembert's principle.

Module 2: Single degree of freedom systems

Free vibration of SDOF (Single Degree of Freedom) systems, undamped, Damped, viscously damped systems; Coulomb damping material and radiation damping. Response of viscously damped SDOF systems to harmonic excitation; Vibration Isolation, Logarithmic decrement.

Unit-II

Module 3: Forced vibrations of SDOF system

Forced vibrations of SDOF system, Response of undamped and damped system subjected to harmonic loading, response to SDOF subject to harmonic base excitation, Duhamel's integral, response to general system of loading, dynamic load factor, response spectrum.

Module 4: Free vibration of MDOF (Multi Degree Freedom System)

Free vibration of MDOF (Multi Degree Freedom System), Natural frequencies, Normal modes, Orthogonality of normal modes, Eigen Values Shear buildings modeled as MDOF systems. Free vibrations, Natural frequencies,

Unit-III

Module 5: Forced vibrations

Forced vibrations, Motion of shear buildings, Model Superposition Method, Response to shear buildings, Base motion, Harmonic fixed excitation. Damped motion of shear buildings, Equations for damped shear buildings, uncoupled damped equations,Condition's for damping uncoupled.

Module 6: Dynamic analysis of base stuffiness matrices

Dynamic analysis of base stuffiness matrices, Lumped mass and consistent mass formulation, Equations of motion.

Unit-IV

Module 7: Vibration of Continuous Systems: Free vibrations of Continuous systems-axial and transverse vibration of bars / beams. Response of continuous systems to dynamic loads. Energy Principle, Rayleigh-Ritz method.

Module 8: Deterministic Earthquake Response of Systems

Rigid Foundation, Types of Earthquake Excitation, Response to Rigid – Soil Excitation, Lumped SDOF elastic systems,Lumped SDOF elastic system, Distributed Parameter Elastic Systems – SRSS, CQC combination of modal responses.

Course Outcomes

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

- Convert structure into SDOF system
- Find response of free and force vibration (harmonic, periodic and transient) of SDOF system.
- Find natural frequency and mode shapes of MDOF system
- Carry out modal analysis of MDOF system

Recommended Book:

1. Chopra, A.K., "Dynamics of Structures", Prentice Hall, 3rd Edition, NY, 1970.
2. Clough, R.W. &Penzin, J., "Dynamics of Structures", McGraw Hill, 1993.
3. Humar, J.L., "Dynamics of Structures", Prentice Hall, 1990.

Coursecode	OEC-PHY-101G				
Category	Open Elective Course				
Coursetitle	**Material Science**				
Scheme and Credits	L	T	P	Credits	Semester- 8th
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of exam	03 Hours				

Course objectives: The course intend to provide the knowledge of

- Crystal structure and defects in solids.
- Classification of different solids.
- Properties of semiconductor, dielectric and magnetic materials.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT - 1 Crystal Structure

Space lattice and translation vectors, Unit cell, Bravais lattice, Closed packed structures, Miller indices, Diffraction of electromagnetic waves by crystals: X-rays, electrons and neutrons,Bragg's law, X-ray diffraction (Laue and Powder method), Point defects in solids - Schottky and Frenkel defects.

UNIT - 2 Electrical Properties

Classification of solids into conductors, semiconductors and insulators, Semiconductor Materials: intrinsic and extrinsic, Fermi level and electron & hole concentrations at equilibrium, Carrier transport:diffusionanddrift,p-njunction, Zener and Avalanche breakdown.

UNIT - 3 Magnetic Properties

Atomic magnetic moments and origin of magnetization,Types of magnetic materials, Ferromagnetism: molecular field, Curie temperature, Domain theory, Hysteresis and its applications.

Superconductivity: Properties of superconductors, Meissner effect, London equations, Elements of BCS Theory, Applications of superconductors.

UNIT - 4 Dielectric Properties

Molecular theory, Polarization, Electric displacement vector, susceptibility, dielectric constant, permittivity and various relations between these parameters, Gauss's law in the presence of a dielectric, Energy stored in a uniform electric field, Concept of local molecular fields and Claussius - Mossotti relation.

Course learning outcome: At the endofthecourse,thestudentshouldatleast beable to:

- Segregate crystals based on their structure and apply effects of defects on manipulating properties ofsolids.
- Distinguish between insulator, conductor and semiconductor. They should know the difference between intrinsic and extrinsic semiconductors and about the fermi level position in these semiconductors.
- Select various dielectric, magnetic materials for specific applications in different fields.

Suggested reference books:

1. Concepts of Modern Physics- Arthur Beiser (TMGH)
2. Solid State Physics- S.O. Pillai (New Age Int. Ltd. Pub.)
3. Modern Physics for Engineers- S.P. Taneja (R. Chand)
4. Engineering Physics- SatyaPrakash (Pragati Prakashan)
5. Engineering Physics- Malik &Singh(McGrawHill)
6. Charles Kittel, Introduction to Solid State Physics, 7thEdition, John Wiley & Sons,2008.
7.S O Pillai, Solid State Physics, 8thedition, New Age international Publishers,2018

Course code	OEC-CH-401-G				
Category	Open Elective Course				
Course title	**Chemistry-II (Chemical Applications)**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester- 8th**
	3	0	**0**	3	
Course Outcomes	1. Distinguish between the structures, reactions and synthesis of polymers, lubricants, metals, alloys and nanomaterials. 2. Comparison of new analytical techniqueswith the classical methods 3. Chemical analysis of corrosion. 4. Assessment of Green chemistry,environmental chemistry and non-conventional energy sources in present context.				

Duration of Exam 3 Hrs	Class Work 25 MarksTheory Exam 75 Marks Total 100 Marks

Note: Examiner will set 9 questions in all with two questions from each unit and one question covering all sections which will be Q.1. This Q1 is compulsory and of short answer type. Each question carries equal marks (15 marks). Examinee have to attempt 5 questions in total, selecting atleast one from each unit.

UNIT-I

Polymers: Mechanism of polymerization and synthesis of polymers. Molecular weight, Crystallinity,melting point and glass transition temperature. Copolymerization. Elastomers-structure and applications, Conducting polymers and applications. Solubility of polymers. Synthesis, properties and uses of PE,PVC, PMMA, Urea-formaldehyde resins, melamine-formaldehyde resins. Composites: characteristics, types and applications.

Modern Analytical techniques: Principle and Applications of Mass spectrometry, Thermal analysis- TGA, DTA and Electron microscopy. Introduction to Scanning tunneling microscope and Atomic force microscope. (12)

UNIT-II

Surfactants and Lubricants: Classification of surfactants.Introduction of micelles. Critical micelle concentration and its determination, cleaning action of detergents. Lubricants-physical and chemical properties, types and mechanism of lubrication.Additives of lubricants.

Corrosion: Introduction, Types ofChemicaland electrochemical corrosion, Theory of electrochemical corrosion. Factors affecting corrosion andMethodsof controlling corrosion. (8)

UNIT-III

Nanomaterials: Properties and application of fullerenes, fullerols, carbon nanotubes and nanowires. Nanomaterials, Applications of nanomaterials incatalysis, telecommunication and medicine.

Metals and Alloys: Phase rule and applications to one (water system), two(Pb-Ag) and three component systems (acetic acid, water &chloroform). Iron-carbon phase diagram. Alloys: Introduction, types (alloys of steel, alloys of Cu, Al and Pb).

(10)

UNIT-IV

Environmental and green chemistry: Air, water and noise pollution. Optimum levels of pollution. Significance and determination of COD, and BOD. Greenhouse effect and global warming, e-Waste, radioactive pollution. Applications of green chemistry and green technology. Concept ofatomic and molecular economy and its use in green chemistry.

Energy science: Analysis of coal. Petroleum refining, liquid fuels, anti-knock agents. Cracking of oils. Limitations offossil fuels. Alternative and non-conventional sources of energy – solar, wind, geo, hydro-power andbiomass- theiradvantages and disadvantages. Nuclear energy, reactors and nuclear waste disposal. Safetymeasures for nuclear reactors.

(12)

Suggested Text Books:

1) Introduction to Nanoscience, by S. M. Lindsay
(2) A Textbook of Engineering Chemistry, by Shashi Chawla
(3) Engineering Chemistry, by S. S. Dara
(4) Engineering Chemistry, by P. C Jain and M. Jain
(5) Journal of Biochem. Biophys. Methods, Vol 67 (2006) pp 151-161
(6) International Journal of Environmental and Analytical Chemistry, Vol 91 (2011), pp 272-279
(7) Advanced Polymer Chemistry, by M. Chanda
(8) A Textbook of Environmental Chemistry, by O. D. Tyagi and M. Mehra
(9) Energy Scenario beyond 2100, by S. MuthukrishnaIyer
10) Physical Chemistry of Metals, by L. S. Darken and R. W. Gurry
11) Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronbergand B. Lindman
12) Physical Metallurgy, by R. E. Reed-Hill

Course Outcomes

Thecourse will enable the student to:

- Distinguish between the structures, reactions and synthesis of polymers, surfactants, lubricants, metals, alloys, colloids and nanomaterials.
- Compare new analytical techniques with the classical methods that use gravimetric and volumetric analysis.
- Carry out chemical analysis of corrosion
- Assess green chemistry, environmental chemistry and non-conventional energy sources in the present context.

Course code	OEC –ME-402G				
Category	Open Elective Courses (OEC)				
Course title	**OPERATIONS RESEARCH**				
Scheme and Credits	L	T	P	**Credits**	Semester-8th
	3	0	0	3	
Objectives:	The aims of operation research include: solving operational questions, solving questions related to resources' operations, and solving decision-making questions. Operational research has a relation with different areas of study and it has several applications. Operation research is considered as a tool of productivity. In comparison to traditional approaches, operation research provides more extensive, quantitative, and detailed information about different issues and managers can implement their decisions based on quantitative analyses. Operation research will be a good assistance for managers in different areas.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on O.R. model building –Types & methods.

Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex GaussJordan reduction process in simplex methods, BIG-M methods computational, problems.

UNIT-II

Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimal, Stepperg stone method, MODI methods, degeneracy, assignment, traveling salesman, problems.

Advanced Topic Of LP: Duality, PRIMAL-DUAL relations-its solution, shadow price, economic interpretation, dual-simplex, post-optimality & sensitivity analysis, problems.

UNIT-III

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.
Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources leveling in project, problems.

UNIT-IV

Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems.
Decision Theory: Decision process, SIMON model types of decision making environment-certainty, risk, uncertainty, decision making with utilities, problems.

Course Outcomes (COs): At the end of the course, the student shall be able to:
CO 1- Discuss the role of operations research in decision-making, and its applications in industry and should be able to formulate and design real-world problems through models & experiments.
CO 2- Knowledge of various types of deterministic models like linear programming, transportation model etc.
CO 3- Explore various types of stochastic models like waiting line model, project line model, simulation etc.
CO 4- Deduce the relationship between a linear program and its dual and perform sensitivity analysis.
CO 5- Describe different decision making environments and apply decision making process in the real world situations

Text Books:

1) Operation Research – TAHA, PHI, New Delhi.
2) Principle of Operations Research – Ackoff, Churchaman, arnoff, Oxford IBH, Delhi.

Reference Books :

1) Operation Research- Gupta & Sharma, National Publishers, New Delhi.
2) Quantitative Techniques- Vohra, TMH, New Delhi 8. Principles of operation Research (with Applications to Managerial Decisions) by H.M.Wagher, Prentice Hall of India, New Delhi.
3) Operation Research – Sharma, Gupta, Wiley Eastern, New Delhi.
4) Operation Research – Philips, Revindran, Solgeberg, Wiley ISE.

Course code	OEC-ME-410G				
Category	Open Elective Courses (OEC) (Semester-VIII) List-III				
Course title	**QUALITY ENGINEERING**				
Scheme and Credits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	To understand the concept of QualityEngineering which emphasizes growth, creativity, and analytical thinking.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Section A

Basic Concepts of Quality: Definitions of Quality and its importance in industry, Quality function, Quality Characteristics, Quality process, Quality Traits, Applications of Quality Concept, Introduction to quality control, Computer aided quality control, Total quality control(TQC) and its implementation, Elements of TQC, Quality Circle, Objectives of quality circle, Role of management in quality circle, Quality in service organizations, characteristics of a service organization, Important service dimensions, Design of service quality.

Section B

Basic Statistical Concepts: The Concept of variation, Distinction between variables and attributes data, The frequency distribution, graphical representation of frequency distribution, Quantitative description of distribution, the normal curve, concept of probability, laws of probability, probability distributions, hyper geometric distribution, binomial distribution, The Poisson distribution.

Section C

Quality systems: Quality systems, Need for quality System, Need for standardization, History of ISO:9000 series standards and its features, steps to registration, India and ISO:9000, Automated inspection systems technologies, Different forms of Inspection, Industrial inspection,

Section D

Total Quality Management: IntroductionTQM, Concepts, Characteristics of TQM, Relevance of TQM, Approaches to TQM Implementation, TQM philosophies, Taguchi Philosphy, JIT, Kaizen, Six Sigma approach, 5-S approach

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

CO1 - Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability

CO2 - Use control charts to analyze for improving the process quality.

CO3 - Describe different sampling plans

CO4 - Acquire basic knowledge of total quality management

CO5 - Understand the modern quality management techniques

Text Books:

1. Quality planning and Analysis, Juran and Gryna, TMH, New Delhi
2. Quality Management, Kanishka Bed, Oxford University Press, New Delhi
3. Introduction to SQC, Montgomery DC, 3e, Wiley, New Delhi
4. Fundamentals of quality control and improvement, A Mitra, Mcmillan pub. Company, NY

Reference Books:

1. Fundamentals of Applied Statistics, Gupta and Kapoor, Sultan Chand and Sons, New Delhi.

Course code	**OEC-CE- 416 G**				
Category	Open elective course				
Course title	**Solid and Hazardous Waste Management**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	3	**0**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Course Objectives:

- To understand the sources of solid and hazardous wastes.
- To understand methods of solid and hazardous waste disposal.
- To gain knowledge of E-Waste management.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE CONTENT

Unit-I

Module:1 Sources and Composition of Municipal Solid Waste

Introduction, Sources and Types of solid waste, Composition of Solid Waste and its Determination, Properties of Municipal Solid Waste

Module:2 Solid Waste Generation and Collection

Quantities of Solid Waste, Measurements and methods to measure solid waste quantities, Solid waste generation and collection, Factors affecting solid waste generation rate, Quantities of materials recovered from MSW.

Unit-II

Module:3 Handling, Separation and Processing of Solid Waste

Material separation by pick in, screens, float and separator magnets and electromechanical separator and other latest devices at site; Waste handling, separation and processing of solid waste at residence, Commercial and industrial site.

Module:4 Disposal of Municipal Solid Waste

Landfill: Classification, planning, sitting, permitting, landfill processes, landfill design, landfill operation, use of old landfill.

Unit-III

Module:5 Hazardous Waste Management

Identification and classification of hazardous solid waste. The magnitude of the problem; Hazardous waste: Risk assessment, Environmental legislation, Characterization and site assessment.

Module:6 Biological Treatment of Solid and Hazardous Waste

Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; oxidative and reductive processes.

Unit-IV

Module:7 Radioactive Waste Management

Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options.

Module:8 Electronic waste management

E waste- Definition, composition; environmental and human health issues, recovery of metals from E waste, E waste management,

Course Outcomes:

After completing this course, students should be able:

- To realize the significance of solid and hazardous waste management in today life
- To understand the processes involved in solid and hazardous waste management
- To comprehend the techniques for various waste management
- To appreciate the role of common/integrated waste management plants

Suggested Books:

1. Basics of Solid and Hazardous Waste Mgmt. Tech. by KantiL.Shah 1999, Prentice Hall.

2. Solid And Hazardous Waste Management 2007 by S.C.Bhatia Atlantic Publishers & Dist.

3. John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005.

Course code	**OEC-ECE-451-G**				
Category	**Open Elective Course**				
Course title	**Electronic Principles**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	3	**0**	0	**3**	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Objective:

1. Study the basic principles of electronic systems.
2. Understand working of Digital electronics.
3. Understand the working of Display devices.

UNIT 1 SEMICONDUCTOR DIODE: P-N junction and its V-I Characteristics, P-N junction as a rectifier, Switching characteristics of Diode. Diode as a circuit element, the load-line concept, half -wave and full wave rectifiers, clipping circuits, clamping circuits, filter circuits, peak to peak detector and voltage multiplier circuits.

UNIT 2 ELECTRONIC DEVICES: LED, Zener Diode as voltage regulator, BJT, UJT, MOSFET, Thyristor, DIAC, TRIAC.

UNIT 3 DISPLAY DEVICES: LED, LCD, Seven Segment, Sixteen Segment.

UNIT 4 DIGITAL ELECTRONICS: Binary, Octal and Hexadecimal number system and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT) NAND, NOR as universal gates, Difference between combinational circuits and sequential circuits, Introduction to flipflops (S-R & J-K).

TEXT BOOK: 1.Integrated Electronics: Millman &Halkias ;McGrawHill
2.Modren Digital Electronics: R.P. Jain; McGraw-Hill

REFERENCE BOOKS:1.Electronics Principles: Malvino ;McGrawHill
2.Electronics Circuits: Donald L. Schilling & Charles Belove;McGrawHill
3.Electronics Devices & Circuits: Boylestad&Nashelsky ; Pearson.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the working of electronic components.
2. Understand the Digital System and various displays.

Coursecode	**OEC-CSE-430G**				
Category	Open Elective Course				
Coursetitle	**Computer Communication**				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Learning Objectives:

1. To Build an understanding of the fundamental concepts of computer networking and familiarizing the student with the basic taxonomy and terminology of the computer networking and data communication.
2. To outline various models, topologies and devices of Computer Networks.
3. To explain the functions of various layers in Network Reference Model.
4. To apply different network concepts in various network communication protocols.

Unit 1

Introduction to Data Communication: Need, components, Data representations communication model, Characteristics of an effective Communication system, Transmission modes: Simplex, Half Duplex and Full Duplex. Serial and parallel transmission. Unicasting, Multicasting, Broadcasting, Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM), Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying,

MULTIPLEXING: FDM, WDM, TDM, packet switching and circuit switching.

Transmission Media: Copper cable, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable. Introduction to Computer Network: applications, benefits and problems, Types of Networks: PAN, LAN, MAN and WAN.

Unit 2

Network Topologies: Introduction to Computer Network Topologies: Mesh Topology, Bus Topology, Star Topology, Ring Topology, Tree Topology, Hybrid Topology, Irregular – Topology.

OSI and TCP/IP Model: Layering architecture of networks, OSI model, Functions of each layer, Services and Protocols of each layer

Unit 3

Media Access Control, Random Access: ALOHA, CSMA and CSMA/CD. Controlled Access: Reservation, Polling and Token Passing. Channelization: FDMA, TDMA and CDMA

Ethernet: Features and types of LANs, Types of Ethernets- Thicknet, Thinnet, Fast Ethernet and Gigabit and 10G Ethernet etc. Concept of Carrier Sense Multiple Access (CSMA)/CD in Ethernet,

Network addressing: Physical addressing, logical addressing and port addressing, MAC addressing in Ethernet, IP V4 addressing: concept of subnet, network and host address, IP address Classes- A, B, C, D and E classes. Introduction to classless addressing.

Unit 4

LAN interconnecting devices: Repeater, Hubs, Switches, Bridges, Routers, Gateways.

Internet and E-mail: Concept of Internet, Advantages of Internet, Security issues in using internet. Application of Internet in various fields: Scientific, Business, Research, Sports, Medicine & Health Care, Engineering, Teaching. HTTP and FTP

Email :concept, Protocols: SMTP, POP, IMAP.

Text Book:

1.Andrew S Tanenbaum, Computer Networks, 5th Edition, Pearson publications, 2010.

2. Forouzan, Data Communication and networking ,5th Edition, Tata McGrawHill, 2012.

3. William Stalling, Data & Computer Communication 6th edition, LPE Pearson Education, 2013.

Reference Books:

Data Communications, Computer Networks and Open Systems (4th edition), Halsall Fred, 2000, Addison Wesley, Low Price Edition.

Computer Networks – A System Approach, Larry L. Peterson & Bruce S. Davie, 2 Edition

Computer Networking – ED Tittel, 2002, T.M.H.

Learning Outcomes: By the end of the course the students will be able to:

1. Independently understand basic computer network technology.

2. Understand and explain Data Communications System and its components.

3. Identify the different types of network topologies and protocols.

4. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

5. Identify the different types of network devices and their functions within a network

Course code	S-CE-418 G				
Category	Seminar				
Course title	**SEMINAR**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	0	**0**	**2**	**1**	
External marks:	25 Marks				
Internal marks:	25Marks				
Total	50Marks				
Duration of Exam	3 Hours				

COURSE CONTENT

During the semester, the students have to:

- Select a topic relevant to analysis, design, implementation, experimental and management of a civil engineering system.
- Undertake a critical review of the literature on the chosen topic.
- Prepare and present a technical report.
- Preparing a review paper forpresentation/Publication in national conference/ International conference/ Journals, if possible.

Course code	**MC-317-G**				
Category	Mandatory courses (non-credit)				
Course title	**Constitution of India**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	2	**0**	0	**0**	
Class work	-				
Exam	-				
Total	-				
Duration of Exam	-				

Course Objectives:
Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rightsperspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional roleand entitlement to civil and economic rights as well as the emergence of nationhood in the earlyyears of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in1917 and its impact on the initial drafting of the Indian Constitution.

*__Note: 1. MC-317G__ is a mandatory non-credit course in which the students will be awarded grades A, B, C, F as per their performance. A: Excellent, B: Good, C: Satisfactory, F: Not Satisfactory. A student who is awarded 'F' grade is required to repeat course**.**

COURSE CONTENT

Module– I
Philosophy of Indian Constitution: Salient features of Indian Constitution, Preamble, and Nature ofIndian Constitution, Procedure for amendment of the Constitution.

Module – II
Federal structure and distribution of legislative and financial powers between the Union and the States.

Module – III
Organs of Governance: President – Qualification and Powers of the President,Governor Qualification and Powers of Governor, Parliament: Composition, Qualifications andDisqualifications, Judiciary: Appointment, Tenure and Removal of Judges.

Module – IV
Fundamental Rights: Origin and development of Fundamental rights, Need for fundamental rights, Introduction to Right to equality, Right to freedom, Right against exploitation, Right to freedom ofreligion, Cultural and Education rights and Fundamental duties.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrivalof Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptutilizationof social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] underthe leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct electionsthrough adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S.N. Busi, Dr. B.R. Ambedkar framing of Indian Constitution, latest Edition
3. M.P. Jain, Indian Constitution Law, Lexis Nexis, latest edition
4. D.D. Basu, Introduction to Constitution of India, Lexis Nexis, latest edition.

Course code	**PROJ- CE-420 G**				
Category	Project				
Course title	**Project Work –II**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester 8th**
	0	**0**	8	**4**	
Class work	75Marks				
Exam	75Marks				
Total	150 Marks				
Duration of Exam	3 Hours				

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under Project work-I or a new topic, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under Project work -I.
2. Review and finalization of the Approach to the Problem relating to the assigned topic.
3. Preparing an Action Plan for conducting the investigation, including team work.
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed.
5. Final development of product/process, testing, results, conclusions and future directions.
6. Preparing a paper for Conference presentation/Publication in Journals, if possible.
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee.