



BOS - 2024



CIVIL ENGINEERING
DEPARTMENT

2024-28: I TO 4TH YEAR
2024-26: M.TECH. CIVIL(TE)
2024-26: M.TECH. CIVIL
(CTM)
2024-26: M.TECH. (ENV)

PANDIT DEENDAYAL
ENERGY UNIVERSITY -
GANDHINAGAR

List of BOS Members

Sr. No	Name of Official	BOS Committee	Designation	Sign
1.	Dr. Dhruvesh Patel	Chairman	Head & Associate Professor, Department of Civil Engineering, PDEU	
2.	Dr. Tejas Thaker	Member, Internal	Assistant Professor, PDEU	
3.	Dr. Rajesh Gujar	Member, Internal	Assistant Professor, PDEU	
4.	Dr. Niragi Dave	Member, Internal	Assistant Professor, PDEU	
5.	Dr. R. P. Singh	Academic Member	Director, Indian Institute of Remote Sensing, Dehradun	
6	Dr. Amitkumar Shrivastava	Academic Member	Professor, Delhi Technological University, New Delhi	
7	Dr. Jaymin D. Patil	Industry Member	Civil Engineering Manager, Toyo Engineering India Pvt. Ltd. , Mumbai	
8	Dr. Mohit Mistry	Industry Member	Civil (Geotech.) Engineer (Maharashtra Ahmedabad High-Speed Rail Project) Arvind Technocrats & Engineers LLP, Navsari, Gujarat	

Invitee Members from Department of Civil Engineering, PDPU

9	Dr. Debasis Sarkar	Member Invitee- Internal	Associate Professor, PDEU	
10	Mr. Naimish Bhatt	Member Invitee- Internal	Assistant Professor, PDEU	

Special Invitee

11	Dr. Dhaval Pujara	Special Invitee	Director SoT, PDEU	
12	Dr. Surendra Singh Kachhwaha	Special Invitee	Dean, SoT, PDEU	

Feedback on the curriculum asked from the following Students and Alumni Members

13	Rudrakshi Choudhary (17BCL089)	Member	UG, 2017 Batch	
14	Ms. Rashi Desai (18BCL082)	Member	UG, 2018 Batch	
15	Mr. Ankit Rajput (18BCL082)	Member	UG, 2018 Batch	
16	Mr. Kaivalya Gadetar (19BCL053)	Member	UG, 2019 Batch	
17	Kundan Patel (M.Tech CIEM)	Member	PG, 2018 Batch	
18	Mr. Bharat Singh Rawat (M.Tech CTE)	Member	PG, 2019 Batch	
19	Ms Shefali Gahrana	Member - UG Allumni	Assistant Manager, L&T Hydrocarbon	
20	Mr. Dharmil Joshi	Member - UG Allumni	Wipro Consumer care and Lightning	

21	Ms. Kundan Patel	Member - UG Allumni	Deputy Executive Engineer, R&B Department, Govt. of Gujarat	
22	Mr. Raj Modi	Member - PG Allumni	Chairman, Modi Construction Pvt. Ltd., Ahmedabad	
23	Mr. Jay Soni	Member - PG Allumni	Assistant Professor,	
24	Mr. Bhagya Ashitbhai Khokhani	Member Allumni	M. Tech Scholar, CEPT University	
25	Ms. Mrunalini Rana	Student Members	Ph.D. Scholar, PDEU	
26	Pranjal Ranpura	Student Members	Ph.D. Scholar, PDEU	

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AGENDA of BOS-2024 (16th April, 2024)

1. Approval B.Tech. Civil Engineering Course Curriculum of 1st to 4th year for 2024-28, to be made effective for the students admitted in the academic year 2024-25 onwards and D to D students admitted from the academic year 2024-25 onwards.
2. Introduction of Teaching & Examination Scheme and Syllabi of Semester – I to IV of the M.Tech. Programme in MTech. Civil (Construction Technology and Management), to be made effective for the students admitted in the academic year 2024-25 onwards.
3. Introduction of Teaching & Examination Scheme and Syllabi of Semester – I to IV of the M.Tech. Programme in MTech. Civil (Transportation Engineering), to be made effective for the students admitted in the academic year 2024-25 onwards.
4. Introduction of Teaching & Examination Scheme and Syllabi of Semester – I to IV of the M.Tech. Programme in MTech. Civil (Environmental Engineering), to be made effective for the students admitted in the academic year 2024-25 onwards.
5. Consideration of review of the feedback received from various stakeholders like parents, alumni, industry experts, recruiters, etc.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

Engineering Graduates will be able to:

PSO 1: UNDERSTANDING: Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.

PSO 2: BROADNESS AND DIVERSITY: Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.

PSO 3: SELF-LEARNING AND SERVICE: Graduates will be motivated for continuous self learning in engineering practice and/or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly

Course structure of B.Tech (Civil Engineering) for batch 2024-28

Semester	Category Code	Course Code	Course Name	Theory	Tutorial	Practical	Hrs	Credits
Semester 1	HSC		Humanities - 1	2	0	0	2	2
	BSC		Mathematics – 1	3	1	0	4	4
	BSC		Physics	3	0	0	3	3
	BSC		Physics – Lab	0	0	2	2	1
	BSC		Environment Science	2	0	0	2	2
	ESC		Workshop Practices	0	0	2	2	1
	BSC		Biology for Engineers	2	0	0	2	2
	ESC		Introduction to Computer Programming – 1	1	0	0	1	1
	ESC		Introduction to Computer Programming – 1 Lab	0	0	2	2	1
	HSC		Universal Human Values	1	0	0	1	1
	HSC		Indian Knowledge System	2	0	0	2	2
				16	1	5	23	20
Semester 2	HSC		Humanities - 2	2	0	0	2	2
	BSC		Mathematics – 2	3	1	0	4	4
	BSC		Chemistry	3	0	0	3	3
	BSC		Chemistry - Lab	0	0	2	2	1
	ESC		Introduction to Electrical Engineering	3	0	0	3	3
	ESC		Introduction to Electrical Engineering-Lab	0	0	2	2	1
	ESC		Engineering Graphics	0	0	4	4	2
	HSC		Yoga, Health & Hygiene OR NCC/NSS	0	0	2	2	1
	HSC		Organizational Behaviour	1	0	0	1	1
	ESC		Introduction to Computer Programming – 2	1	0	0	1	1
	ESC		Introduction to Computer Programming – Lab	0	0	2	2	1
				13	1	12	26	20

Course structure of B.Tech (Civil Engineering) for batch 2024-28

Semester 3	Pro		Civic and Social Service Internship	0	0	0	0	1
	BSC		Mathematics – 3	3	1	0	4	4
	ESC		Introduction to Artificial Intelligence	3	0	0	3	3
	PC		Building Materials and Construction Technology	3	0	0	3	3
	PC		Building Planning and Computer Aided drawing	1	0	2	3	2
	PC		Solid Mechanics	4	0	0	4	4
	PC		Concrete Technology	2	0	0	2	2
	PC		Material Testing Laboratory	0	0	2	2	1
				16	1	4	23	20
Semester 4	ESC		Industry 4.0 (Department Specific)	2	0	0	2	2
	ESC		Industry 4.0 - Lab (Department Specific)	0	0	2	2	1
	OE		Open Elective 1 (From Other School)	3	0	0	3	3
	PC		Fluid Mechanics	3	0	2	5	4
	PC		Engineering Geology and Soil Mechanics	3	0	2	5	4
	PC		Surveying Practices	3	0	2	5	4
	PC		Structural Analysis	3	1	0	4	4
	Pro		Industrial Orientation					0
				17	1	8	26	22

Course structure of B.Tech (Civil Engineering) for batch 2024-28

Semester 5	OE		Open Elective 2 (NPTEL/SWAYAM/MOOC))	3	0	0	3	3
	HSC		Engineering Economics	3	0	0	3	3
	PE		Program Elective 1	3	0	0	3	3
	PC		Hydrology and Water Resources	3	0	2	5	4
	PC		Foundation and Geotechnical Applications	3	0	2	5	4
	PC		Design of RCC Structures	3	0	0	3	3
	PC		Computer Aided Design Drawing Lab - I	0	0	2	2	1
				18	0	6	24	21
Semester 6	OE		Open Elective 3 (From Other Department of FoET)	3	0	0	3	3
	PE		Program Elective 2	3	0	0	3	3
	PE		Program Elective 3	3	0	0	3	3
	PC		Design of Steel Structures	3	0	0	3	3
	PC		Computer Aided Design Drawing Lab - II	0	0	2	2	1
	PC		Environmental Engineering	3	0	2	5	4
	PC		Highway and Traffic Engineering	3	0	2	5	4
				18	0	6	24	21

Course structure of B.Tech (Civil Engineering) for batch 2024-28

Semester 7	Pro		Summer Internship	0	0	0	0	2
	OE		Open Elective 4 (From Other Department of FoET)	3	0	0	3	3
	PE		Program Elective 4	3	0	0	3	3
	PE		Program Elective 5	3	0	0	3	3
	PC		Estimation Costing Contracts and Valuations	3	1	0	4	4

	PC		Project Management	3	0	2	5	4
	PC		Earthquake Engineering	3	1	0	4	4
	Pro		Seminar					1
				18	2	2		24
Semester 8	Pro		Major/Comprehensive Project					12

<Course Code>					<Mathematics – I>					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

1. To be able to evaluate problems related to differential and integral calculus of complex functions.
2. To be able to obtain area, volume using integral calculus.
3. To be able to formulate and solve various engineering problems using the calculus.
4. To study the properties of sequence and series and to check the convergence and divergence.

UNIT I: DIFFERENTIAL CALCULUS AND ITS APPLICATIONS

08 Hrs.

Partial derivative and its application - Euler's theorem - Total derivatives - Jacobians – Maxima and Minima of two variables using Lagrange's multipliers. Taylor's series, Convergence of power series.

UNIT II: INTEGRAL CALCULUS AND ITS APPLICATIONS

12 Hrs.

Definition and evaluation of double integral (Cartesian – Polar form) – Change of orders - Change of variables – Evaluation of triple integral, change of variables (Cartesian to spherical – and cylindrical) – Applications, area – volume – center of mass – center of gravity by double and triple integral.

UNIT III: VECTOR CALCULUS

10 Hrs.

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector Integration – Simple problems on line, surface and volume integrals – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (without proofs) – Simple application involving cubes and rectangular parallelepipeds.

UNIT IV: SEQUENCE AND SERIES

12 Hrs.

Definition. Convergent, divergent, bounded & monotone sequences. Infinite sums: Basics Taylor series, Convergence and divergence, Tests for convergence for positive term series, Alternating series – Leibnitz test, Absolute convergence, conditional convergence.

TOTAL HOURS: 42 Hrs.

COURSE OUTCOMES

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

- CO1 : Identify the use of convergence of infinite series in engineering aspects.
- CO2 : Understand the concept of Directional derivative, Irrotational and Solenoidal vector fields.
- CO3 : Apply the concept of differential and integral calculus in engineering problems.
- CO4 : Analyze the obtained solution in linear and non-linear domains.
- CO5 : Appraise mathematical problems from complex domain.
- CO6 : Evaluate problems on Green's, Stokes' and Divergence theorems.

TEXT/REFERENCE BOOKS

1. B. S Grewal, Higher Engineering Mathematics, Khanna Pub.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley.
4. G. Strang, Linear Algebra and its Applications, Cengage Learning.
5. K. Hoffman and R. A. Kunze, Linear Algebra, Prentice Hall of India.

					Engineering Physics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To master the concepts of vector algebra and the fundamentals of mechanics
- To explore the principles of elasticity in solids, band theory of solids and the Physics of semiconductors.
- Investigate the behavior of waves and oscillations, along with their applications in acoustics and ultrasonics.
- Gain insights into thermal physics, covering conduction, convection, and radiation, and their practical applications.

UNIT 1 Mechanics	12 Hrs.
Introduction to vector algebra, Vector fields and scalar fields, Concepts of gradient, Divergence and Curl, Gauss-Divergence Theorem, Stokes' theorem and its applications, The everyday forces of Physics, Work-energy theorem, Rigid body motion and the conservation of angular momentum, Center of mass, Center of gravity, Moment of inertia: Definition, Moment of inertia of simple planar laminas.	
UNIT 2 Physics of Solids	10 Hrs.
Elasticity, Stress & Strain, Hook's law, Young's modulus, Poisson's ratio, Rigidity modulus, Relationship between elastic constants, Properties of solids, electrical conductivity, Wiede-mann Franz Law, Band structure of conductor, insulator and semiconductor, Intrinsic and extrinsic semiconductor, Conductivity of semiconductors, charge concentrations, Hall effect, LED and Solar cells, Magnetism and its origin, Magnetic properties of solids, Physics of superconductors, Applications.	
UNIT 3 Waves, Oscillations and Acoustics	8 Hrs.
Waves and oscillations: Types of waves, Simple harmonic motion, Damped simple harmonic motion, types of damping, Forced oscillation, Resonance, Energy Transport in Wave motion. Acoustics & Ultrasonic: Introduction to Sound, Sabine's reverberation theory, Acoustical defects and their remedies, Doppler Effect, Ultrasonic waves, Methods of their generation and detection, Properties and applications of ultrasonic waves.	
UNIT 4 Thermal Physics	12 Hrs.
Thermodynamic systems (closed and open), Thermodynamic properties and equilibrium, Concepts of heat and work, Laws of thermodynamics, Carnot cycle, Heat transfer-thermal expansion of solids and liquids, Conduction in solids, Thermal conductivity, Forbe's method, Lees' disc method, Thermal insulation and its applications, Thermal Convection and its applications, Newton's law of cooling, Thermal Radiation – emission and absorption radiation, emissive power, Black body radiation, Stefan's laws, Wien's law.	
Max. <42> Hrs.	

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 Describe fundamental concepts of mechanics, such as vector algebra, everyday forces of Physics, Moment of inertia, etc.
 CO2 Explain the principles underlying the physics of solids, including elasticity and the behavior of energy bands.
 CO3 Solve problems involving mechanics, solids, waves, oscillations, and acoustics
 CO4 Analyze the behavior of waves, oscillations, and thermal phenomena, including their practical applications
 CO5 Critically evaluate the significance of thermodynamic laws and superconductivity theories in solving real-world problems.
 CO6 Develop solutions and innovative applications in mechanics, solids, waves, and thermal physics by integrating concepts and principles learned throughout the course.

TEXT/REFERENCE BOOKS

1. D. Kleppner and R. J. Kolenkow, An Introduction to Mechanics, Tata McGraw-Hill.
2. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, John Wiley & Sons.
3. Sears and Zemansky, University Physics, Pearson publications.
4. M. N. Avadhanulu, P.G. Kshirsagar, A textbook of Engineering Physics, S Chand & Co. Ltd.
5. F. M. A. Wahab, Solid State Physics: Structure and Properties of Materials, Narosa Publishing House Pvt. Ltd.
6. Richard, Oscillations and Waves: An Introduction, Taylor & Francis.
7. Y. A. Cengel, Introduction to Thermodynamics and Heat Transfer, Tata McGraw-Hill.
8. B. Lal and N. Subramaniam, Heat and Thermodynamics, S Chand & Co. Ltd.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100**

Part A: 10 Questions each carrying 5 marks
 Part B: 5 Questions each carrying 10 marks

Exam Duration: 3 Hr.

50 Marks
 50 Marks

					Engineering Physics Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To comprehend the operation of diverse electrical, mechanical, and optical instruments utilized within the laboratory setting.
- To grasp fundamental principles of Physics and apply them effectively in the execution of experiments.
- To acquire hands-on experience in Physics through experimental work, fostering practical understanding.

List of Experiments

1. To determine the acceleration due to gravity 'g' using a simple pendulum.
2. To determine the acceleration due to gravity 'g' using a bar pendulum.
3. To determine the electrical conductivity of metals.
4. To study the characteristics of Si solar cells.
5. To explore the usage of Digital Oscilloscope.
6. To study the phenomenon of photoconductivity using CdS photo-resistor.
7. To determine linear thermal expansion coefficient of solid bodies.
8. To study the phenomenon of Hall Effect.
9. To determine volumetric coefficient of expansion of liquids.
10. To study the reflection of ultrasonic waves.
11. To demonstrate/investigate resonance in forced oscillations.
12. To study the principle of heat pump.
13. To determine energy band gap of semiconductor using four probe method.
14. To measure the slit width of single, blade and double slits.
15. To determine e/m using Thomson's method.

** Any 10 experiments will be conducted.

COURSE OUTCOMES

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

- CO1 - Apply mathematical reasoning to analyze the concepts of mechanics.
 CO2 - Compare and contrast experimental results to determine electrical and thermal conductivity.
 CO3 - Demonstrate and implement the concepts of waves and oscillations.
 CO4 - Investigate the electrical properties of a given semiconductor device.
 CO5 - Examine the charge transport mechanism in different conductors.
 CO6 - Analyze the behavior of waves, oscillations, and thermal phenomena in experiments.

TEXT/REFERENCE BOOKS—

1. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, John Wiley & Sons.
2. C. Kittel, Introduction to Solid State Physics, John Wiley.
3. C.S. Robinson, R. Das, Textbook of Engineering Physics Practical, University Science Press.
4. Kittel, Knight and Ruderman, Mechanics - Berkeley Physics Course, Tata McGraw-Hill.
5. Avadhanulu, A text book of engineering Physics, S. Chand & Company, Ltd.
6. Brij Lal, N. Subrahmanyam, Heat and Thermodynamics, S. Chand & Company, Ltd

Evaluation**Max. Marks: 100**

Continuous evaluation

50 marks

End semester examination and Viva-voce

50 marks

					ENVIRONMENTAL SCIENCE					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES

1. To develop a comprehensive perspective of environment and sustainable development
2. To understand the causes and effects of various types of pollution
3. To develop an understanding of the various strategies for controlling the pollution
4. To introduce the emerging environmental domains

UNIT I : INTRODUCTION TO ENVIRONMENT

05 Hrs.

Sustainable Development; Sustainable Development Goals; Environmental Studies – Its importance and Multidisciplinary nature, Introduction to Environmental Parameters and their standards (air, water, soil, noise, etc.); Ecosystem and its types, Ideal ecosystem, Biodiversity : Its importance and conservation.

UNIT II : MULTI-SCALE ENVIRONMENTAL POLLUTION (GLOBAL, REGIONAL AND LOCAL)

06 Hrs.

Pollution, Causes and Effects of different types of pollution : Air Pollution, Water Pollution, Soil Pollution, Solid Waste (organic and Inorganic) Pollution, Hazardous Waste Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Radioactive Pollution; Introduction to man-made disasters like floods, heat waves, landslides, etc., Introduction to the various instruments for measuring air pollution, water pollution, noise, etc.

UNIT III : ENVIRONMENTAL POLLUTION CONTROL STRATEGIES

09 Hrs.

Multi-approaches for reducing various types of pollution: Introduction to Water and Wastewater treatment technologies, Air and Noise pollution control techniques, Introduction to different environmental management concepts like Swachh Bharat Mission, Mission LiFE (Lifestyle For Environment), etc. Indian Culture and Traditional Wisdom for managing environment

UNIT IV: EMERGING ENVIRONMENTAL MANagements DOMAINS

08 Hrs.

Concept of Zero Liquid Discharge (ZLD) and the reuse of the treated wastewater, Green Credit Rules - 2023, Clean Development Mechanisms (CDM) and Carbon Credits, Green Buildings, Carbon Footprint and Water Footprint, Green Business, International Environmental Laws, Environmental Auditing, Smart Technology.

TOTAL HOURS: 28 Hrs.

COURSE OUTCOMES:

- CO-1: Demonstrate comprehension of sustainable development and environmental aspects.
CO-2: Recognize the interdisciplinary characteristics inherent in Environmental studies.
CO-3: Evaluate the impact of various pollutants on the environment.
CO-4: Assess the efficacy of different technologies for environmental pollution control.
CO-5: Analyze different environmental management policies and their implications.
CO-6: Synthesize knowledge about emerging environmental management paradigms.

TEXT-BOOK AND REFERENCE BOOKS:

1. Bharucha Erach, Textbook for Environmental Studies, UGC New Delhi
2. Daniel B. Botkin & Edwards A. Keller, Environmental Science, Wiley INDIA edition.
3. Miller T. G. Jr., 2006. Environmental Science, Clengage Learning, India
4. R. Rajagopalan, Environmental Studies, Oxford University Press
5. Gilbert Masters and Wendell P. Ela, 2012. Introduction to Environmental Engineering and Science, PHI Learning Pvt Ltd, New Delhi

<Course Code>					Workshop Practice					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To understand safety in various manufacturing processes.
2. Learn how to use various measuring tools for engineering applications.
3. Hands on training and preparation of job using wood, metal and sheet as per drawing.
4. Understand various manufacturing processes like machining, welding, soldering and 3D printing for prototypes.

LIST OF EXPERIMENTS

- 1 Introduction to Workshop safety, layout and identification of various materials- plastic, wood, metals-ferrous and nonferrous, rubber, glass etc.
- 2 Use of measuring tools for engineering applications
- 3 Fitting job: Detailed drawing of work piece, use of fitting tools and job preparation.
- 4 Carpentry job: Detailed drawing of work piece, use of carpentry tools and job preparation.
- 5 Sheet metal job: Detailed drawing of work piece, use of sheet metal working tools and job preparation.
- 6 Plumbing job: Internal/External threading, piping network using Tees, Elbows, Reducer, Bends etc
- 7 Hands on training on mini lathe and milling machine
- 8 Demonstration of welding, brazing and soldering
- 9 Soldering and desoldering for PCB
- 10 3D printing using polymer and metal.

COURSE OUTCOMES

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

- CO1 : Define workshop safety and various engineering materials
CO2 : Understand various measuring equipment
CO3 : Apply various workshop tools in preparing job for carpentry, fitting, sheet metal and plumbing
CO4 : Examine various manufacturing operations like welding and machining
CO5 : Evaluate soldering operation for PCB
CO6 : Create prototype using 3D printing

TEXT/REFERENCE BOOKS

1. S. K. Hajra Choudhury, Elements of Workshop Technology, Vol. I & II, Media Promoters and Publishers.
2. H. S. Bawa, Workshop Practice, Tata-McGraw Hill.
4. Kalpakjian S. And Steven S. Schmid, Manufacturing Engineering and Technology, Pearson Education India Edition.
5. Rao P.N., Manufacturing Technology, Vol. I and Vol. II, Tata McGraw Hill House.

<Course Code>					Biology For Engineers					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES

1. To understand the basic biological concepts and their engineering applications.
2. To introduce the students with an understanding of biodesign principles to create novel devices and structures.
3. To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
4. To study the development of interdisciplinary vision of biological engineering.

UNIT I: INTRODUCTION TO BIOMOLECULES

7 Hrs.

Cell as a basic unit of life, prokaryotic and eukaryotic cells, microbes, plant and animal cells; Cell organelles – structure and function; Cell membrane. Vitamins and Minerals, Carbohydrates, Lipids, Amino Acids and proteins, Nucleic Acids (DNA and RNA).

UNIT II: NATURE-BIOINSPIRED MECHANISMS

7 Hrs.

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics). The eye functions as a camera. Heart as a pump system, The ear and nose as signal transmission models. Lungs operate as an exchange model, kidneys function as a filtration system. Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro).

UNIT III: TRENDS IN BIOENGINEERING

7 Hrs.

Stem cell and its applications, Bio printing techniques and materials. Applications of Bioinformatics, Artificial Intelligence for diagnosis and detection of communicable and non-communicable diseases, Biosensors in healthcare, Environmental monitoring, Food Safety and Biosecurity.

UNIT IV: ENGINEERING PERSPECTIVES OF BIOLOGICAL SCIENCES

7 Hrs.

Biology and engineering crosstalk – At cell level: Hybridoma technology, At tissue level: Plant Tissue Culture, Animal Tissue Culture; Tissue Engineering, Introduction to Biomimetics and Biomimicry, Nanobiotechnology, Introduction to Radiology, High-throughput diagnostics in clinics: Molecular Diagnostics (PCR), DNA chips.

TOTAL HOURS: 28 Hrs.

COURSE OUTCOMES

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

- CO1 : Gain fundamental knowledge of origin of life.
- CO2 : Demonstrate the involvement of major organs and systems in the human body as models for bioengineering design.
- CO3 : Analyse the scope and opportunities of Implementing bioengineering concepts relates to advanced imaging and diagnostic techniques for clinical diagnosis and disease management.
- CO4 : Get acquainted with concepts of bioengineering trends including biosensors, AI , Imaging techniques in disease diagnosis and treatment
- CO5 : Focus on implications of Bioinspired designs, Bioengineering trends including, tissue engineering and molecular diagnostics.
- CO6 : Think critically towards exploring innovative biobased solutions for socially relevant problems.

TEXT/REFERENCE BOOKS

1. Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M., Biology for Engineers, Tata McGraw-Hill, New Delhi.
2. Arthur T. Johnson, Biology for Engineers, CRC Press, Taylor and Francis.
3. Geoffrey M.Cooper, The Cell: A molecular Approach, ASM Press.
4. Sohini Singh and Tanu Allen, Biology for Engineers”, Vayu Education of India, New Delhi.
5. Yoseph Bar-Cohen, “Biomimetics: Nature-Based Innovation, CRC Press.
6. Stuart Fox, Krista Rompolski, Human Physiology”, McGraw-Hill (eBook).
7. D. Floreano and C. Mattiussi, Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, MIT Press.

<Course Code>					Introduction to Computer Programming -I (For ME/CH/CL/BT)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
1	0	0	1	1	25	25	50	--	--	100

COURSE OBJECTIVES

1. To develop a greater understanding of the issues involved in programming language, design and implementation.
2. To inculcate functional and logical problem-solving skills through programming.
3. To understand the basic concepts of C programming.

UNIT 1: Basics Of C Programming

2 Hrs.

History and significance of C, Anatomy of a C program, Input, Output constructs, built-in data types in C: int, float, char, types of Operators, Operator precedence and associativity.

UNIT 2: Control Flow and Functions

4 Hrs.

Control Structures – if, if-else, if-elseif ladder, nested if, switch statement, and Loop Structure- for loop, while loop, do-while loop. Built-in functions, User defined functions, Parameterized Vs Non-Parameterized functions, function return values, nested functions

UNIT 3: Arrays, Strings, Pointers

5 Hrs.

Declaration and initialization of arrays, Accessing array elements, One-dimensional, Two-dimensional and Three-dimensional arrays, String operations on Character arrays, In-built String functions, Pointer, Pointer arithmetic, Pointer to pointer, Array of Pointers

UNIT 4: Structures and File Handling

3 Hrs.

Declaring a Structure, Accessing Structure Elements, Array of Structures, Basic file operations, File creation, File deletion, File access modes such as read, write, append, File concatenation, File handling using seek function.

14 Hrs.

COURSE OUTCOMES

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

CO1 - Understand basics of programming.

CO2 - Identify different programming constructs for a problem.

CO3 - Apply appropriate derived data type for data storage.

CO4 - Prepare a user defined data type based on data attributes.

CO5 - Construct user defined functions for problem solving.

CO6 - Analyse different data structure based on application requirement.

TEXT/REFERENCE BOOKS

1. Kernighan & Ritchie, C Programming Language, PHI
2. K. N. King , C Programming: A Modern Approach, W.W. Norton
3. David Griffiths and Dawn Griffiths, Head First C: A Brain-Friendly Guide, O'Reilly.
4. E.Balaguruswamy, Programming in ANSI C, McGraw-Hill.
5. Y.P. Kanetkar, Let us C", BPB Publication.
6. Y.P. Kanetkar, Pointers in C, BPB Publications.

<Course Code>					Introduction to Computer Programming -I Laboratory (For ME, CL, CH, BT)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	25	25	50

COURSE OBJECTIVES

1. To understand the basic concepts of C programming
2. To understand design and implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing
3. To develop understanding of Compilation process.

LIST OF EXPERIMENT

1. **Introduction to Computer Programming:** Compilation process of a C program, program execution flow, Tokens, variables, keywords and identifiers.
2. **Simple and formatted Input Output Operations:** Data types, Operators, Input /output statements in C, Formatted I/O, format specifiers, escaper sequences
3. **Decision making and branching:** if, if-else, if-else ladder, nested if, Switch, go to statement, conditional operator statement
4. **Looping control structures:** while, do-while, for loop, Break statement, Continue statement
5. **Basics of modular programming:** Introduction to modular programming through basic function syntax, introduction to header file creation, difference between #include <filename> and #include "filename"
6. **Array and Strings:** One dimensional and multidimensional array, Declaration, initialization, Array Manipulations. Matrix operations,
7. **Introduction to Pointers:** Pointer declaration and initialization, Pointer operators, Arithmetic operations using pointer.
8. **Structure and Union:** Structure, Arrays and structures, structures and functions, pointer to structure, self-referential structures, typedef, unions
9. **Functions:** Introduction to user defined functions, Types of Functions, Call by value, Call by reference
10. **File Handling in C:** File handling in C, Different types of files, Operations on Files, File handling functions.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Identify the use of appropriate naming conventions and programming style including appropriate comment density.
- CO2 - Implement a basic C program using appropriate control structure.
- CO3 - Apply appropriate derived data types based on data attributes.
- CO4 - Develop the problem solution modularly.
- CO5 - Design user defined functions for problem solving and reuse them across different programs.
- CO6 - Apply suitable file handling and data structures.

TEXT/REFERENCE BOOKS

1. Kernighan & Ritchie, C Programming Language, PHI
2. K. N. King , C Programming: A Modern Approach, W.W. Norton
3. E. Balaguruswamy, Programming in ANSI C, McGraw-Hill
4. Y.P. Kanetkar, Let us C, BPB Publication
5. Y.P. Kanetkar, Pointers in C, BPB Publication

<Course Code>					Universal Human Values					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
1	0	0	1	1	25	50	25	--	--	100

COURSE OBJECTIVES

1. To understand the need of nurturing human values through the process in value-based education system.
2. To understand and develop a holistic perspective on self-exploration and being in harmony with family, society and nature.
3. To facilitate the students in understanding harmony at all the levels and applying in their profession and work place to lead an ethical life.

UNIT I: HUMAN VALUES AND PROCESS OF VALUE EDUCATION

04 Hrs.

Human values, human aspirations and the ultimate goal, understanding happiness and prosperity, appraise the meaning of satisfaction and happiness in current scenario, harmony and compatibility, values imbibed education system and process

UNIT II: KNOWING SELF - HARMONY WITH SELF

04 Hrs.

Understanding self, capabilities and challenges, understanding material (physical facilities) and spiritual needs - need of mind and body, understanding body as an instrument, harmony between mind and body, synchronizing physical health and mental health, practicing healthy habits for healthier me

UNIT III: HARMONY IN RELATIONSHIP – FAMILY, SOCIETY AND NATURE

03 Hrs.

Harmony in relationships, values for harmony in any human-human interaction, harmony in family, and society, trust and respect for others, self esteem and ego, equality, equity, inclusion and liberation, concept of '*Vasudhaiva Kutumbakam*', understanding co-existence and sync with nature

UNIT IV: HARMONY IN PROFESSION AND ETHICAL BEHAVIOR

03 Hrs.

Ethical human conduct, acceptance and respect, appraising the qualities of others, professional competence for enabling harmony in system and enabling universal human order, scope of eco-friendly systems, strategies to reach the harmonious ecosystem to reach Universal Human Order '*Sarvabhauma Vyavastha*'

TOTAL HOURS: 14 Hrs.

COURSE OUTCOMES

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

- CO1 - Understand the significance of human values, its need, and process of value education.
- CO2 - Appraise the meaning of happiness and prosperity as short- and long-term goal of life. Understand them and in context of the current scenario
- CO3 - Distinguish between the mind and body, physical and spiritual wellbeing for harmony within self
- CO4 - Assess the value of harmonious relationship based on trust, respect and enduring its role in all human-human relationships to build harmonious society
- CO5 - Understand the importance of harmony with nature and appreciate co-existence for harmonious ecosystem.
- CO6 - Create the perfect professional place and work environment following the ethical practices and strategize to uphold the human values at all the levels and interactions.

TEXT/REFERENCE BOOKS

1. R. R. Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and Professional Ethics, Excel books.
2. A. Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
3. A. N. Tripathi, Human Values, New Age Intl. Publishers.
4. M. K. Gandhi. The Story of My Experiments with Truth, Fingerprint Publishing.
5. Ivan Illich, Energy & Equity, The Trinity Press, Worcester, and Harper Collins.
6. E. F. Schumacher, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
7. Sussan George, How the Other Half Dies, Penguin Press.

<Course Code>					Mathematics – II					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs. / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

1. Understand and apply principles of complex differentiation and integration effectively.
2. Solve systems, find eigenvalues, and apply transformations confidently.
3. Solve various ODEs, apply methods, and tackle engineering problems.
4. Analyze periodic functions, derive series, and apply in diverse applications.

UNIT 1 COMPLEX DIFFERENTIATION AND INTEGRATION

12 Hrs.

Limit, Continuity, Differentiability of the function of a complex variable, Analytic function, Cauchy-Riemann equation (in Cartesian coordinates), Harmonic function and its significance, Singularities, Definition of a Complex line integral, Contour integrals, Cauchy integral theorem, Cauchy Integral formula (CIF), CIF for derivatives, Taylor's series and Laurent Series, Calculation of residues, Cauchy Residue theorem, Applications of residues to evaluate real definite integrals.

UNIT 2 MATRIX ALGEBRA AND ITS APPLICATIONS

10 Hrs.

Solution of system of algebraic equation - Rank of a matrix, consistency of system of equation - Characteristic equation of a square matrix- Eigen values and Eigenvectors of a real matrix - Properties of Eigen values and Eigen vectors - Cayley-Hamilton theorem (without proof) - finding inverse of a matrix - Diagonalization of a matrix.

UNIT 3 ORDINARY DIFFERENTIAL EQUATIONS WITH APPLICATIONS

10 Hrs.

Differential equations of Higher-order differential equations with constant coefficients, Rules for finding C.F. and P.I., Method of variation of parameters, Cauchy and Legendre's linear equations, Linear differential equations of second order with variable coefficients; Simultaneous linear equations with constant coefficients, applications of higher-order differential equations in solving engineering problems.

UNIT 4 FOURIER SERIES

10 Hrs.

Periodic functions, Odd and even functions, Euler's formulae for Fourier series in an interval of length 2π , Change of interval, Dirichlet's conditions, Half range Sine and Cosine series, Complex Fourier series, Parseval's identity and its applications.

TOTAL HOURS: 42 Hrs.

COURSE OUTCOMES

On completion of the course, students will be able to

- CO1 : Recall fundamental concepts of complex differentiation, matrix algebra, differential equations, and Fourier series.
- CO2 : Understand the significance of complex differentiation, integration, Matrix, ODE and Fourier series in respective contexts.
- CO3 : Apply the concept of complex function, Matrix, ODE and Fourier series to extract the solutions of engineering problems
- CO4 : Analyze the use of complex variable Matrix, ODE and Fourier series in engineering problems.
- CO5 : Assess the significance and effectiveness of mathematical concepts and theorems in solving real-world problems, particularly in engineering and scientific applications.
- CO6 : Design and construct solutions to complex mathematical problems using a variety of techniques, including transformations, mappings, and advanced methods in differential equations.

TEXT/REFERENCE BOOKS

1. R.V. Churchill and J. W. Brown, Complex variables and Applications, McGraw-Hill.
2. J. M. Howie, Complex Analysis, Springer-Verlag.
3. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
4. Erwin Kreyszig, Advanced Engineering Mathematics", John Wiley.
5. G. Strang, Linear Algebra and its Applications, Cengage Learning.
6. K. Hoffman and R. A. Kunze, Linear Algebra", Prentice Hall of India.

<Course Code>					Engineering Chemistry					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

1. To develop the fundamental understanding about traditional materials.
2. To provide the knowledge about structural features, synthesis, properties of various categories of advanced materials.
3. To develop the knowledge and skills for different characterization techniques of materials.
4. To provide the knowledge about the role of chemistry in modern engineering applications.

UNIT I: CHEMISTRY OF ENGINEERING MATERIALS

12 Hrs.

Traditional Materials: Introduction and classification of materials; metallic materials, polymeric, ceramic materials Advanced Materials: Introduction to nanomaterials: Properties and application; Carbonaceous materials (fullerene, carbon nanotube, graphene, etc.); Composite materials; Liquid crystals: Classification and Application

UNIT II: MODERN ANALYTICAL TECHNIQUES

10 Hrs.

Instrumentation, principle and characterization of materials: X-ray diffraction (XRD), Electro analytical techniques; FTIR, UV-visible spectroscopy; Thermal analysis (TGA-DTA-DSC); Chromatographic techniques (GC, HPLC)

UNIT III: ADSORPTION, CATALYSIS AND KINETICS

10 Hrs.

Adsorption - Characteristics, Classification, Application , Adsorption isotherms- Freundlich, Langmuir & BET Chemical Kinetics - Rate law, Arrhenius equation, Transition state theory, Collision theory; Complex reactions Catalysis - Homogeneous and Heterogeneous Catalysis; Mechanism of Catalysis; Industrial Applications of catalysts

UNIT IV: CHEMISTRY OF ENERGY DEVICES

10 Hrs.

Principles of primary and secondary batteries, Fuel Cells and their operation principles, Principles and uses of supercapacitors; Photocatalytic hydrogen production: Principles and challenges; Traditional and new generation solar cells.

TOTAL HOURS: 42 Hrs.

COURSE OUTCOMES

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

- CO1 : Remember the structural features and properties of different classes of traditional materials
- CO2 : Classify advanced materials like nanomaterials, carbonaceous and composite materials, and liquid crystals
- CO3 : Apply the skills by understanding various instrumental techniques for characterisation of materials.
- CO4 : Analyse the key concepts in engineering chemistry viz. adsorption and chemical kinetics and laterally ponder over the applications of such concepts in engineering challenges.
- CO5 : Justify the important insights into the industrial application of different types of catalysis via analysing mechanisms of catalysis.
- CO6 : Develop the knowledge on the role of chemistry in various modern engineering applications such as in energy devices.

TEXT/REFERENCE BOOKS

1. W.D. Callister, An Introduction to Materials Science & Engineering, John Wiley & Sons.
2. MW Barsoum, Fundamental of Ceramics, IOP publishing.
3. T. Pradeep, Text book of Nanoscience and Nanotechnology, Mc. Graw Hill Education.
4. Murty, Shankar, B Raj, Rath, Murday, Textbook of Nanoscience and Nanotechnology", Springer.
5. V. Raghavan, Materials Science and Engineering, Prentice-Hall of India Private Limited.
6. A. Douglas, Donald Skoog, M. West, Principles of Instrumental Analysis, Cengage.
7. Jain & Jain, Engineering Chemistry, Dhanpat Rai Publishing Company.

<Course Code>					Engineering Chemistry Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To enhance and develop scientific and analytical skills
2. To relate concepts learned in chemistry and engineering to the real-world situations.
3. To acquire skills to perform laboratory experiments.
4. To demonstrate safe and proper use of standard chemistry glassware and equipment.

LIST OF EXPERIMENTS

- 1 **Iodometry**– To determine the strength of given copper sulphate solution by titrating against N/20 sodium thiosulphate (hypo) solution
- 2 **Iodimetry**– To determine the strength of given ascorbic acid by titrating against standard N/10 iodine solution
- 3 **Complexometric Titration**– To determine the total, permanent and temporary hardness of given water by complexometric titration using standard 0.01M EDTA solution
- 4 **pH metric titration**– To determine the strength of given HCl solution using a standard NaOH solution by performing a pH-metric titration
- 5 **Conductometric titration**– To determine the strength of given HCl solution using a standard NaOH solution by performing a conductometric titration
- 6 **Chemical Kinetics**– To study the kinetics of decomposition of sodium thiosulphate by a mineral acid
- 7 **Drawing chemical structures** - To Draw Chemical Structures of organic molecules using ChemDraw
- 8 **Colorimetric determination**: To determine the concentration of copper present in the effluent of electroplating industries by using colorimeter.
- 9 **Detection of biomolecule**: Detection of the presence of carbohydrates in test solution by using Benedict's reagent
- 10 **Preparation of drug molecule**: Preparation of Aspirin from salicylic acid
- 11 **Polymerization**– To prepare a polymer (Nylon 6,10), identify the functional groups by FT-IR

COURSE OUTCOMES

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

- CO1 : Recall the concepts learned in chemistry and engineering to the real-world situations.
- CO2 : Show the ability to identify, analyse and interpret the results from the experiments.
- CO3 : Experiment with the instrumental method using conductometer and pH meter.
- CO4 : Analyse compounds by titrimetric, gravimetric and instrumental methods.
- CO5 : Determine the concentration of unknown solutions by spectrophotometric method.
- CO6 : Predict the reaction rate and predict the order and rate constant.

TEXT/REFERENCE BOOKS

1. V. K. Ahluwalia, S Dhingra, A. Gulati, College Practical Chemistry, Universities Press.
2. J.B. Baruah, P Gogoi, Foundations of Experimental Chemistry, PharmaMed Press.
3. S. S. Sawhney, M. S. Jassal, S.P. Mittal, A Text Book of Chemistry Practical, Vol. I & II, APH Publishing Corp.

<Course Code>					Elements of Electrical and Electronics Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

1. To impart knowledge on DC and AC circuits.
2. To learn construction, working principle and characteristics of transformer and induction machines.
3. To introduce students to various means for electrical safety, protection of electrical installations and Batteries.
4. To understand rectification through p-n junction diode, applications of diode and Transistor Characteristics.

UNIT I: DC CIRCUITS

10 Hrs.

Electrical circuit elements (R, L and C), voltage and current sources, dependent and independent sources, Ohms Law, temperature co-efficient of resistance, Kirchhoff current and voltage laws, voltage and current divider circuit, Thevenin and Norton Theorems and their equivalents, maximum power transfer and superposition theorems, nodal and mesh analysis, star-delta transformation, Time domain analysis/natural response of first order RL and RC Circuit

UNIT II: AC CIRCUITS

10 Hrs.

Generation of AC voltage, representation of sinusoidal waveforms, RMS values of different sinusoidal waveforms, Rectangular and Polar representation of phasor, Sinusoid representation in time and frequency domain, Analysis of single-phase ac series circuits consisting of R, L, C, RL, RC, RLC combinations, instantaneous power, average power and reactive power, complex power and power factor. AC parallel circuit and its solution in admittance form, resonance in AC series and parallel circuits, polyphase circuits, star and delta representation of polyphase circuits, power measurement in polyphase circuits.

UNIT III: INTRODUCTION TO ELECTRICAL MACHINES AND ELECTRICAL INSTALLATION

12 Hrs.

Magnetic materials and its B-H characteristic, Faraday's Law of Electromagnetic Induction; **Single Phase Transformers:** Construction, working principle, types, EMF equation, ideal transformer, practical transformer, Operation of transformer on no-load and load, **Induction Machine:** construction, types of 3-phase induction motors, working principle, production of rotating magnetic field, operation, starting and running torques, Torque-slip characteristics, Power Stages in an induction motor.

Components of LT Switchgear: 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, Electrical safety rules.

UNIT IV: BASIC OF ELECTRONICS AND ELECTRICAL INSTALLATION

10 Hrs.

Semiconductor Diodes and Applications, Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices–LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications.

Transistor Characteristics covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Field Effect Transistor (FET) – Construction, Characteristics of Junction FET.

TOTAL HOURS 42 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 – Understand electrical circuits using network theorems.
- CO2 – Compare the behaviour of R, L and C and their combinations in AC circuits.
- CO3 – Analyze balanced polyphase systems in star and delta configurations.
- CO4 – Understand the construction, working and basic characteristics of transformer and induction machines.
- CO5 – Recognize the importance of protective devices, electrical safety measures and characteristics of Batteries.
- CO6 -- Demonstrate application of different diodes in circuits and Understand the Transistor characteristics.

TEXT/REFERENCE BOOKS

1. J. Bird, "Electrical Circuit Theory and Technology", Routledge, Tailor and Francis Group, Sixth Edition.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
3. B. L. Theraja, "Electrical Technology", Vol. 1, S. Chand Publication, New Delhi.
4. Surjit Singh, "Electrical Estimating and Costing", Dhanpat Rai and Co.
5. Boylestad and Nashlesky, "Electronic Devices and Circuit Theory", PHI.

					Elements of Electrical and Electronics Engineering Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To gain practical knowledge on DC and AC circuits
2. To learn operation of electrical instruments and electrical machines
3. To introduce students to various means for electrical safety, protection of electrical installations
4. To understand characteristics and applications of semiconductor diodes and transistors.

LIST OF EXPERIMENTS

1. Introduction to elements of electrical engineering laboratory and to study different electrical measuring instruments.
2. To Verify Ohm's law with linear resistors and find power dissipation in resistor.
3. To validate Thevenin and Norton theorem for DC circuits.
4. To validate Superposition and Maximum Power Transfer theorem for DC circuits.
5. To evaluate the AC R, L and R-L series circuit performance and to measure the active power, reactive power and apparent power connected with single phase AC supply.
6. To evaluate performance of AC R-L parallel circuit and to measure the active power, reactive power and the apparent power connected with single phase AC supply.
7. To perform a direct load test on a single-phase transformer and determine the efficiency and voltage regulation at different loads.
8. To measure three phase power using two wattmeter method.
9. To draw the time-current characteristics of MCB and study the function of ELCB.
10. To obtain the VI characteristic of silicon and germanium diodes.
11. To obtain reverse characteristics of Zener diode.
12. To study half wave, full wave and bridge rectifiers.
13. To determine the DC Characteristics of BJT in CE Configuration.

COURSE OUTCOMES

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

- CO1 – To understand the basic operation of electrical equipment's & measuring instruments.
- CO2 – To perform various network theorems for DC circuits.
- CO3 – To understand the performance of AC circuit with R, L load.
- CO4 – To evaluate star and delta configuration of polyphase system and measure power in polyphase system.
- CO5 – To evaluate the performance of single phase transformer.
- CO6 – To understand the working principle of semiconductor diodes, transistor characteristics and its applications.

<Course Code>					Engineering Graphics - Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	--	--	50	50	100

COURSE OBJECTIVES

1. To cover the fundamental of engineering drawing and standards used in drawing.
2. To explain the students to communicate ideas using orthographic and isometric projection methods.
3. To help students to use CAD software to prepare drawings.
4. To demonstrate the presentation of drawing using sketching and 3D modelling in CAD tool.

LIST OF EXPERIMENTS

- 1 Introduction to Engineering Graphics: Principles of engineering graphics and their significance, drawing instruments & accessories, lettering and numbering, types of lines, dimensioning methods, basic geometric drawing, reading a drawing.
- 2 Orthographic Projection: Introduction to projection, types of projection, 1st angle and 3rd angle projection
- 3 Isometric Projection: Principles of isometric projection – isometric scale, isometric views, conventions, conversion of isometric views to orthographic views and vice-versa
- 4 Projection of Solids and Development of Surface: Classification of solids, projections of solids like cylinder, cone, pyramid, and prism with its inclination to reference plane, development of surfaces of right regular solids - prism, pyramid, cylinder and cone.
- 5 Introduction of Computer Aided Engineering Drawing: Demonstrating knowledge of the theory of CAD software, use of software in drawing, CAD software user interface, commands, Coordinate System, menus and toolbars, planes, dimensioning, saving of files, Select and erase objects, zoom tools, and others
- 6 Basic sketching using CAD tool: Sketch entities using tools – origin, points, lines, circle, arcs, polygons, fillets and chamfer, trim, extend and offset, copy, cut, delete and others
- 7 Advanced sketching using CAD tool: Sketching entities using relation constrains, Mirror, Patterning, full definition of drawing and others
- 8 Basic 3D modelling using CAD tool: Extrude, cut, drawing on different planes, editing, symmetric, revolving, and others
- 9 Computer aided drawing sheets: Preparing drawing sheets, creating different views, section view, drawing templates, and others

COURSE OUTCOMES

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

- CO1 : Recalling the fundamentals of engineering graphics by considering basic rules of drawing, dimensioning, and labelling.
- CO2 : Explain the principle of projection using orthographic and isometric projection.
- CO3 : Represent the 2-dimensional drawing using CAD tool.
- CO4 : Construct the 3-dimensional geometries using CAD tool.
- CO5 : Apply the concept of engineering drawing by organizing drawing views and applying necessary dimensions by preparing drawing sheets
- CO6 : Analyse the intricate details of solid using projection of solid, sectioning of solid and development of lateral surfaces.

TEXT/REFERENCE BOOKS

1. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing.
2. Shah P.J., Engineering Graphics, S. Chand Publishing.
3. Agrawal, B. & Agrawal C. M., Engineering Drawing, Tata McGraw Hill Publishers.
4. Hanifan R, Perfecting Engineering and Technical Drawing, Springer International Publishing Switzerland.
5. Corresponding Set of CAD Software Theory and User Manuals.

<Course Code>					Introduction to Computer Programming II (For ME/CL/CH/BT)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
1	0	0	1	1	25	50	25	-	-	100

COURSE OBJECTIVES

1. To develop a greater understanding of the foundational principles of the Python programming language
2. To acquaint with the data structures offered in Python.
3. To inculcate functional and logical problem-solving skills through programming.

UNIT 1: Fundamentals of Python Programming

4 Hrs.

Introduction- History of python, Silent features, Advantage and Applications, Tools and its Framework, Variables, Input and Output

UNIT 2: Decision and Control Statements

4 Hrs.

Operators in Python, Decision statements- If statements, If-else statements, Nested If-else statements, Control Statements - For, While, For-Else, While-Else, Continue and Break statements

UNIT 3: Data Structures and Collection

3 Hrs.

String manipulation, List and slicing, Tuple, Set and Dictionary, Numpy and Dataframes

UNIT 4: Function and File Handling

3 Hrs.

Built-in and user defined functions, Actual and Formal Parameters, Scope, Create, Read and Write text files

14 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the basics of python programming such as syntax, datatypes, variable declarations.

CO2 - Understand the fundamental of data structures in python such as list, tuple, set, dictionary and strings.

CO3 - Understand the use of built-in functions, custom modules and packages.

CO4 - Apply Python's features to solve problems and implement decision-making and loops.

CO5 - Evaluate the effectiveness of functions and judge Python code quality.

CO6 - Evaluate Python scripts, create functions, and design programs for file handling tasks.

TEXT/REFERENCE BOOKS

1. John V Guttag, Introduction to Computation and Programming Using Python, PHI.
2. Allen Downey, Jeffrey Elkner and Chris Meyers, How to think like a Computer Scientist, Learning with Python, Green Tea Press.
3. Martin C. Brown, Python: The Complete Reference, Osborne, McGraw-Hill.
4. R. Nageswara Rao, Core Python Programming", Dreamtech Press.

<Course Code>					Introduction to Computer Programming II Laboratory (For ME/CL/CH/BT)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	25	25	50

COURSE OBJECTIVES

1. To develop a greater understanding of the foundational principles of the Python programming language
2. To acquaint with the data structures offered in Python.
3. To inculcate functional and logical problem-solving skills through programming.

LIST OF EXPERIMENT

1. **Installation:** Installing Python on Windows, Mac, and Linux.
2. **Introduction of Different Tools & Framework:** Introduce and utilizes different tools and frameworks for python program development
3. **Fundamentals of Python Programming**
Variable declaration, initialization, different syntax and keywords, Input/output operations
4. **Decision Statements:** Operators- Arithmetic, Logical, etc., Decision-making - if, if-else, and nested if-else statements.
5. **Control Statements:** Control statements such as for loops, while loops, and their application, Continue and break statement
6. **Data Structure:** Demonstrate string manipulation techniques, including string concatenation, list, slicing, and formatting.
7. **Python Collection:** Implement programs that illustrate the characteristics and usage of tuples, sets, and dictionaries, numpy, dataframes.
8. **Function:** Develop Python functions to perform common tasks, including mathematical operations, string manipulation, and data processing, Built-in and user-defined functions, parameter actual and formal parameters, Implement functions with different scopes.
9. **File Handling:** Develop Python scripts that create, read, and write text files, showcasing file handling operations such as opening, reading, writing, and closing files.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply Python basics tools, laying the foundation for practical usage.

CO2 - Apply Python's features to manipulate data structures effectively for solving real-world problems.

CO3 - Apply decision-making and looping to solve practical challenges.

CO4 - Analyze Python code to select appropriate constructs and data structures for optimal performance.

CO5 - Evaluate function effectiveness in Python programs for code quality and efficiency.

CO6 - Develop Python scripts and programs with robust file handling, utilizing modular functions for enhanced organization and reusability.

TEXT/REFERENCE BOOKS

1. John V Guttag. Introduction to Computation and Programming Using Python, PHI.
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python, Green Tea Press.
3. Martin C. Brown, Python: The Complete Reference, Osborne, McGraw-Hill.
4. R. Nageswara Rao, Core Python Programming, Dreamtech Press.

					Mathematics – III					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs. / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

1. The primary objective of this course is to provide students with a comprehensive understanding of advanced mathematical transforms and their applications in engineering.
2. To use the concept of Laplace transform and its significance in solving differential equations.
3. Understand the fundamental concepts of difference equation and Z-transform.
4. To use this basic course in upcoming courses in respective specializations in higher classes.

UNIT 1 LAPLACE TRANSFORM

10 Hrs.

Piecewise continuous functions and exponential functions, Definition, Existence and Properties of Laplace transforms, Heaviside function, Impulse function, Inverse Laplace transform, Properties of inverse Laplace transforms, Convolution theorem, Applications of Laplace Transforms in solving differential equations.

UNIT 2 DIFFERENCE EQUATION AND Z-TRANSFORM

11 Hrs.

First and second order difference equation with constant coefficient, Solution of difference equation-complementary function-Particular integral, Z - transform, Properties of Z-transforms, Convolution of two sequences, inverse Z-transform, Solution of Difference equations using Z-transform.

UNIT 3 FOURIER TRANSFORM

10 Hrs.

Fourier Integral, Fourier Cosine and Sine transform, Discrete Fourier Transform, Continuous Fourier Transform, Linearity, time shifting, frequency shifting, and convolution properties, Applications in image processing, communication systems, and quantum mechanics.

UNIT 4 PARTIAL DIFFERENTIAL EQUATIONS

11 Hrs.

Formation of Partial Differential Equations (PDEs), Solutions of PDEs of the first order, Cauchy problem for first-order PDEs, Lagrange's method, Charpit and Jacobi methods for solving first-order nonlinear PDEs. Classification of second order PDEs, one-dimensional heat equation, wave equation, and Laplace equation, Applications of PDE's to wave analysis.

TOTAL HOURS: 42 Hrs.

COURSE OUTCOMES:

CO-1: Define the partial differential equations of first and second order in order to model or understand the Engineering applications.

CO-2: Understand the techniques of Laplace transforms, Z-transforms, and Fourier transforms to solve critical mathematical problems.

CO-3: Apply the methods of Transform techniques to solve differential equations involving piecewise continuous and exponential functions.

CO-4: Classify the partial differential equations of different orders and solve those using different techniques.

CO-5: Appraise engineering or scientific problems that can be addressed using transform techniques.

CO-6: Formulate and create various application problems in engineering using series and Transform techniques.

TEXT/REFERENCE BOOKS:

1. R.K. Jain & S.R.K. Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House.
2. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning.
4. K. Sankara Rao, "Introduction to Partial Differential Equations", PHI Learning.
5. T. Amaranth, "An Elementary Course in Partial Differential Equations", Narosa Publishing House, New Delhi.
6. Glynn James, "Advanced Modern Engineering Mathematics", Pearson.

					Introduction to Artificial Intelligence					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	03	25	50	25	--	--	100

COURSE OBJECTIVES

1. Understand key concepts and applications of Artificial Intelligence (AI).
2. Master statistical analysis and data visualization with Python.
3. Gain proficiency in implementing various machine learning algorithms.
4. Develop practical skills in data preparation, model training, and evaluation.
5. Apply regression and classification algorithms to solve real-world problems.

Unit-1: INTRODUCTION ARTIFICIAL INTELLIGENCE

08 Hours.

Introduction to Artificial Intelligence; Applications and Techniques of AI; Applications in Engineering: Predictive maintenance, quality control, design optimization, autonomous systems; Ethical and Social Implications: Bias, privacy, job displacement; Future Trends: Explainable AI, Ethics, Regulation; Future of Work; Real-world AI applications; AI Career Advice

UNIT-2: STATISTICS AND DATA VISUALIZATION

10 Hours.

Introduction to Statistics and Data Visualization; Descriptive Statistics (Mean, Median, variance etc) with NumPy and Pandas; Visualization (Line Plot, Scatter Plot, Bar Chart, Histogram, Pie Chart, Box Plot, Heatmap, Area Plot, Contour Plot); Customizing Plots for Better Presentation; Exploratory Data Analysis (EDA); Real-World Case Studies and Examples, Hands-On Exercises using Python/R etc.

UNIT-3: MACHINE LEARNING ALGORITHMS

12 Hours.

Introduction to Machine Learning, ML Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning; ML applications across different sectors, ML Data Preparation, Training and Test Sets, Regression Models (Linear Regression, Decision Tree, Random Forest, Support Vector etc); Accuracy Assessment; Model Comparison; Practice on real world datasets.

Unit-4: SUPERVISED AND UNSUPERVISED LEARNING

12 Hours.

Difference between Regression and Classification; Working Principles of Unsupervised and Supervised Classification Algorithms: K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine; Clustering Algorithms: Hierarchical, Agglomerative Clustering, Partitional etc. Confusion Matrix, Accuracy Assessment, Hyperparameters; Practice on real world datasets.

Max. 42 Hours.

COURSE OUTCOMES

- CO1:** Understand the principles and applications of Artificial Intelligence (AI) in various fields.
- CO2:** Apply statistical analysis and data visualization techniques to explore and present data effectively.
- CO3:** Demonstrate proficiency in data preparation, model training, and evaluation for machine learning tasks.
- CO4:** Utilize regression algorithms to solve real-world problems.
- CO5:** Apply classification algorithms to solve real-world problems.
- CO6:** Analyze and interpret the results of machine learning models to make data-driven decisions.

TEXT/REFERENCE BOOKS

1. Russell, S., & Norvig, P. (2016). **"Artificial Intelligence: A Modern Approach"**, Pearson.
2. McKinney, W. (2017). **"Python for Data Analysis"**, O'Reilly Media.
3. Murphy, K. P. (2012). **"Machine Learning: A Probabilistic Perspective"**. MIT Press.
4. Provost, F., & Fawcett, T. (2013). **"Data Science for Business"**. O'Reilly Media.
5. Müller, A. C., & Guido, S. (2016). **"Introduction to Machine Learning with Python"**. O'Reilly Media.

					Building Materials and Construction					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES:

1. To understand the concept of materials used in building construction.
2. To introduce the different building components.
3. To study the difference between super structure and sub structure used in construction engineering.
4. To study techniques used in construction engineering.

UNIT I: BUILDING MATERIALS AND COMPONENTS

12 Hrs.

Materials: Natural: Stone, brick, aggregates types and properties. Artificial: cement types and properties, concrete blocks (LWC, AAC) admixtures, supplementary cementitious materials, timber, aluminum, plastics, Modern materials: Glass, Ceramics, Sealants for joints, Fibre glass reinforced plastic, clay products, composite materials, fibre textiles (Geomembranes and Geotextiles for earth reinforcement), recycled concrete aggregates.

UNIT II: BUILDING COMPONENTS

08 Hrs.

Foundation- types, walls, beams, columns, arches, trusses, lintels, staircase and escalator, flooring, roof (truss, terrace, prefab roof), Bridges, girders and offshore platforms.

UNIT III: CONSTRUCTION PRACTICES

10 Hrs.

Substructures: Earthwork, formwork (mivan), dewatering, Superstructures: stone masonry, brick masonry, scaffoldings – erection and dismantling, damp and water proofing, plastering, paint and varnish for wood, waterproofing, termite proofing, and fire proof, thermal and sound insulation.

UNIT IV: CONSTRUCTION TECHNOLOGY AND EQUIPMENT

12 Hrs.

Construction technology: Shotcrete, techniques of box jacking, pipe jacking- under water construction of diaphragm walls and basement. Tunnelling and piling techniques, Precast and Prefabricated structures, Prestressed concrete and types, Construction Equipment: Earth movers, Excavators, handling and hauling equipment, mixers, compactors, dewatering equipment, equipment for erection of structures, trenching and tunneling.

TOTAL HOURS: 42 Hrs.

COURSE OUTCOMES:

- CO-1: Identify the latest materials used in buildings their applications
CO-2: Understand different components of buildings and their applications
CO-3: Understand and apply different practices for sub structure
CO-4: Understand and apply different practices for super structure
CO-5: Evaluate different construction technology methods.
CO-6: Examine different construction equipment used in construction

TEXT/REFERENCE BOOKS

1. Varghese.P.C, “Building Materials”, PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Rajput. R.K., “Engineering Materials”, S. Chand and Company Ltd., 2008.
3. Sankar, S.K. and Saraswati, S., “Construction Technology”, Oxford University Press, New Delhi, 2008.
4. S.C.Sharma, “Construction Equipment & Management”, Kindle Edition, 2018

					Building Planning and Computer Aided Drawing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
1	0	2	2	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To learn about different principles of planning and building bye laws and functions of governing bodies.
- To study the terminology used for building planning and different aspects of the building with fire protection.
- To learn about plan, elevation and section of the building for residential and commercial buildings.

1. UNIT I: BUILDING BYLAWS AND FUNCTIONS

02 Hrs.

Introduction: Building industries, Classification of Buildings, Components of Building, Orientation of Building, Principle of Planning, National Building Code of India – 2005, Objectives and Scope of Building Bye Laws, Function of Different Governing Authority. Signs and Symbols with Abbreviations used in Building Drawing, Different types of Doors and Windows.

UNIT II: FUNCTIONAL PLANNING AND BUILDING TERMINOLOGY

03 Hrs.

Building Planning: Aspect and Prospect of Building, Types of area, Set-back, FSI, Building Bye Laws of Residential Building, Some of Important Terminology related with Building Planning, Fire Protection Kingpost Truss, Queen post Truss, Stairs Drawing of 30 cm Wall Section from Foundation to Slab (GF + FF).

UNIT III: PLANNING OF RESIDENTIAL BUILDING

04 Hrs.

Building Drawings: Types and Site Selection for Residential Building, Minimum, Dimensions of the Rooms for Residential Building, Planning Process and Requirement of Different Rooms of Building, Line Diagram and Site Plan for residential Building Planning of Single Story Residential Building Planning of Double Story Residential Building.

UNIT IV: PLANNING PUBLIC BUILDING AND PERSPECTIVE DRAWING

05 Hrs.

Planning of Different Public Building. Perspective Drawing: Necessity, Principles and Characteristics of Perspective Drawing Terminology Related with Perspective Drawing, Classification of Perspective Drawing. Planning of Public Building (School, Bank, Commercial Complex, etc- Two Point Perspective Drawing.

TOTAL HOURS: 14 Hrs.

COURSE OUTCOMES

- CO-1: Explain local building bye-laws and provisions of national building code in respect of building and town planning.
- CO-2: Draw different abbreviations of buildings.
- CO-3: Demonstrate the functional aspects of planning and architecture for buildings.
- CO-4: Prepare working drawings, foundation plans and other executable drawings with proper details for residential buildings.
- CO-5: Prepare working drawings, foundation plans and other executable drawings with proper details for public buildings.
- CO-6: Execute building plans, 3d drawings of buildings using software.

TEXT/REFERENCE BOOKS

- N. Kumara Swamy, A. Kameswara Rao **“Building Planning And Drawing”**, Charotar Publications
- B. P. Verma, **“Civil Engineering Drawing and House Planning”**, Publishers.
- Gurcharan Singh **“Building Planning Designing and Scheduling”**.
- S. S. Bhavikatti (Author), M. V. Chitawa **“Building Planning and Drawing”**.

					Building Planning and Computer Aided Drawing Lab					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
1	0	2	2	3	25	50	25	--	--	100

COURSE OBJECTIVES

1. To understand the fundamental principles and concepts of planning and architecture for buildings.
2. To study about different views of layout.
3. To learn the development controls covered by building bye laws and national building code for buildings.

LIST OF EXPERIMENTS

- 1 List out abbreviations and symbols used in building planning. (2 A-2 size sheet).
- 2 Draw a layout of different types of doors, windows, trusses and stairs used in building. (4 A-2 separate sheet for each component).
- 3 Draw typical layout of building principles (1 A-1 size sheet).
- 4 Draw typical layout of Plan – Section – Elevation for Single storied residential building ((1 A-1 size sheet).
- 5 Draw typical layout of Plan – Section – Elevation for Double storied residential building ((1 A-1 size sheet).
- 6 Draw typical layout of Plan – Section – Elevation for Public Building (Bank, School, Commercial Complex) (1 A-1 size sheet).
- 7 Draw a perspective drawing of building (1 A-1 size sheet).
- 8 Draw typical layout of Plan – Section – Elevation for Double storied residential building in Auto-CAD with basic commend (1 A-1 size sheet printed).

COURSE OUTCOMES

Co-1: Draw different abbreviations of buildings.

Co-2: Demonstrate the fundamental principles, concepts of planning and architecture for buildings.

Co-3: Prepare working drawings, foundation plans and other executable drawings with proper details for buildings.

Co-4: Demonstrate local building bye-laws and provisions of national building code in respect of building.

Co-5: Explain building bye laws and principles of planning for residential and public buildings.

Co-6: Execute building plans, 3d drawings of buildings using software.

TEXT/REFERENCE BOOKS

1. **NATIONAL BUILDING CODE.**
2. S.C.Rangwala, **“CIVIL ENGINEERING DRAWING”.**
3. Dr. H.J. Shah, **“Building Planning and Drawing”**, Charter Publishing House Pvt. Limited 2007.

					Solid Mechanics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES:

1. To analyze stress and strain in structural components under different loading conditions.
2. To apply theoretical concepts to solve engineering problems related to material behavior.
3. To design and evaluate the structural integrity of components using industry-standard methods

UNIT I: COMPOUND STRESSES, SFD AND BMD

16 Hrs.

Review of forces, moments, equilibrium, and free-body diagrams. Shear force and bending moment diagrams for statically determinate beams with complex loading. Compound stresses- Analytical and graphical method.

UNIT II: FLEXURAL AND SHEAR STRESSES IN BEAMS

16 Hrs.

Introduction to CG and MI, Simple bending theory, flexural stresses, shear stresses, shear centre, Uniform torsion.

UNIT III: COMBINED STRESSES

12 Hrs.

Stresses under the combined action of direct loading and bending moment, determination of stress in the case of retaining walls, chimney and dams, overturning and sliding, stress due to direct loading and bending moment about both axis.

UNIT IV: SLOPE AND DEFLECTION

12 Hrs.

Deflection of beams: Introduction, Elastic curve derivation of differential equation of flexure, Sign convention, Slope and deflection for standard loading classes using Engineering methods

Standard cases of end conditions and corresponding effective length, buckling, principal axes, Euler's and Rankine's formula

TOTAL HOURS: 56 Hrs.

COURSE OUTCOMES:

- CO-1: To introduce students to the principles of statics and dynamics applied to engineering structures.
CO-2: To comprehend the fundamental principles of stress and strain in solid materials.
CO-3: To analyze and calculate the deformations in structural elements subjected to various loading conditions.
CO-4: To analyze and calculate the stresses in structural elements subjected to various loading conditions.
CO-5: To apply theoretical concepts and analytical techniques to solve problems related to the behavior of structural components.
CO-6: To evaluate the mechanical properties of materials commonly used in civil engineering practice.

TEXT/REFERENCE BOOKS

1. Shah, H. J., "**Mechanics of Solids**", Charotar Publishing House.
2. Subramanian, R., "**Strength of Materials**", Oxford University Press.
3. Junnarkar, S. B., & Shah, H. J., "**Mechanics of Structures, Vol. - I & II**", Charotar Publishing House.
4. Kassimali, A., "**Structural Analysis**", Cengage Learning India.
5. Hibbeler, R. C., "**Mechanics of Materials**". Pearson.
6. Beer, F. P., Johnston, E. R., & Dewolf, J.T., "**Mechanics of Materials**". Tata Mcgraw-Hill
7. Popov, E. P., "**Mechanics of Materials**". Pearson.
8. Megson, T.H.G., "**Structural and Stress Analysis**", Butterworth - Heinemann

					Concrete Technology					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES:

8. To understand the concept of materials used in concrete construction.
9. To introduce the difference between binders, mortars and concrete.
10. To study the mix design of modern concrete and their applications in construction engineering.
11. To study the hardened and durability properties of concrete and their applications to construction engineering.

UNIT I: CONCRETE INGREDIENTS

08 hrs.

CEMENT: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement

AGGREGATES: Classification of aggregate – Particle shape & texture –, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

MINERAL ADMIXTURES: Introduction to supplementary cementing materials, sustainability and pozzolans. Fly ash, blast furnace slag, silica fume, and metakaolin – their production, properties, and effects on concrete properties; applications

CHEMICAL ADMIXTURES: Water reducers, air entrainers, set controllers, and effects on concrete properties.

UNIT II: MIX DESIGN OF CONCRETE

06 hrs.

Mix Design as per latest IS method; particle packing density, Cement Mortars, Mortar specifications, types and tests of mortars.

Ready Mixed Concrete Design: Mixing, transport, and placement; consolidation, finishing, and curing of concrete; Extreme weather concreting, special concreting methods.

UNIT III: FRESH AND HARDENED PROPERTIES OF CONCRETE

07 hrs.

Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water. Hardened Properties: Compressive strength and parameters affecting it; Tensile strength, Flexural Strength and Bond Strength – direct and indirect; Factors affecting parameters.

UNIT IV: DURABILITY PROPERTIES OF CONCRETE

07 hrs.

Introduction to durability: relation between durability and permeability, Chemical attack of concrete corrosion of steel rebar, other durability issues. Non-destructive testing methods – codal provisions for NDT. Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & Shrinkage. QA/QC of concrete.

Total Hours: 28 hrs.

COURSE OUTCOMES:

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

- CO-1: Identify the modern concrete ingredient, properties and their uses
- CO-2: Understand different binder and mortars ratios and their applications
- CO-3: Create mix design of concrete as per latest IS and ACI codal provision
- CO-4: Classify the different fresh and hardened properties of concrete
- CO-5: Evaluate durability properties of concrete.
- CO-6: Examine the quality control concrete

TEXT/REFERENCE BOOKS

1. R. Santhakumar, "Concrete Technology" oxford university press, 2011.
2. M.S. Shetty, "Concrete Technology- Theory and Practice", S.Chand Publication.
3. M.L.Gambhir, "Concrete Technology", TaTaMacgrawhill publication
4. A.M.Neville, "Concrete Technology", Pearson education India ltd
5. IS:10262-2019, IS:4031 (Part 1 to 15), IS:383-1970

					Material Testing Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

4. To illustrate different material properties and their applications.
5. To test the performance of different binders, mortars ratios and different graded concrete
6. To simulate hardened and durability properties of concrete.

LIST OF EXPERIMENTS:

- 1 To study and evaluate the fineness modulus of fine and coarse aggregates.
- 2 To study flakiness and elongation index test for different graded coarse aggregates.
- 3 To study specific gravity of fine and coarse aggregates.
- 4 To Study fineness of cement by sieve analysis.
- 5 To Study the specific gravity of cement
- 6 To study consistency test of cement
- 7 To study initial and final setting properties of cement
- 8 To study soundness of cement by Le-Chatelier method
- 9 To study compressive strength of binder and mortar cubes
- 10 To study fresh properties of concrete by different methods.
- 11 To measure hardened properties of concrete.
- 12 To study Non-Destructive test of concrete by Rebound Hammer test.
- 13 To measure bending stress on wooden beam/concrete beam
- 14 To Study tensile test of mild steel.

COURSE OUTCOMES

- CO-1: Understand engineering properties of aggregates by performing laboratory tests necessary for building construction.
- CO-2: evaluate engineering properties of cement by performing laboratory tests necessary for building design and construction.
- CO-3: Compute the grade & properties of concrete by performing laboratory tests necessary for building construction
- CO-4: Select and design different mortar ratios
- CO-5: Create smart concrete mix design which can be used for cost effective construction of building
- CO-6: Determine the mechanical and durability test results and evaluate the suitability for construction purpose

TEXT/REFERENCE BOOKS

1. R. Santhakumar, **"Concrete Technology"**, oxford university press, 2011.
2. M.S. Shetty, **"Concrete Technology- Theory and Practice"**, S.Chand Publication.
3. M.L.Gambhir, **"Concrete Technology"**, TaTa Macgrawhill publication
6. A.M.Neville, **"Concrete Technology"**, Pearson education India ltd

					Industry 4.0					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES

1. Understand Industry 4.0 concepts and technologies for transforming industrial processes.
2. Apply BIM principles and tools in civil engineering projects, integrating with GIS, IoT, and project management.
3. Evaluate and apply sustainable building design principles in the context of Industry 4.0.
4. Analyze emerging technologies in civil engineering for enhanced project efficiency and sustainability.

UNIT I : INTRODUCTION AND BASIC CONCEPTS OF INDUSTRY 4.0

7 Hrs.

Introduction to Industry 4.0, Definition, General framework, Application areas, Introduction to the Evolution of Industrial revolutions, Key features, Need and benefits, Introduction to Industry 4.0 core technologies: Big data, Advanced Robotics, Simulation, Integration, Internet of Things (IoT), Artificial Intelligence (AI), Cybersecurity, Cloud computing, Additive manufacturing and Augmented Reality, Overview of machine learning for Industry 4.0, Transformation of industrial processes through the integration of modern technologies such as sensing and actuation, communication, and computational processing..

UNIT II : BUILDING INFORMATION MODELLING APPLICATIONS

7 Hrs.

Introduction to Building Information Modelling (BIM), Principles and Concepts of BIM in Project Management, BIM Software and Tools for Project Planning, Execution, and Monitoring, BIM Applications in Civil Engineering Projects, BIM Level of Detail (LOD) and Level of Development (LOD) Standards, Best Practices for BIM Implementation in Projects, Integration of BIM with GIS and IoT, Project Management Principles in Civil Engineering, BIM for Project Planning and Scheduling, BIM for Project Tracking and Monitoring.

UNIT III : SUSTAINABILITY AND CONSTRUCTION INNOVATION

7 Hrs.

Introduction to Sustainable Building Design and its Alignment with Industry 4.0 Principles, Principles and concepts of sustainability in construction, Sustainable building materials and techniques, Energy-efficient design strategies, Water conservation and management in building design, Waste management and recycling in construction, Green building certifications and standards (e.g., LEED, BREEAM, GRIHA), Indian building codes and regulations for sustainable construction, Simulation tools for sustainable building design (e.g., EnergyPlus, Designbuilder, IES VE), 3D Printing in Construction for Sustainable Practices.

UNIT IV: EMERGING TECHNOLOGIES IN CIVIL ENGINEERING

7 Hrs.

Internet of Things (IoT) Applications, Augmented Reality (AR) and Virtual Reality (VR) in Civil Engineering, Robotics and Automation, Use of Drones (UAVs), Smart Sensors and Monitoring Systems, Advanced Materials, Remote Sensing Applications, Drone Technology for Surveys and Monitoring, Smart Cities, Case Studies and Future Trends

TOTAL HOURS: 28 Hrs.

COURSE OUTCOMES:

- CO-1: Demonstrate an understanding of Industry 4.0 technologies and their impact on industrial processes.
- CO-2: Apply Building Information Modelling (BIM) principles and tools in civil engineering projects.
- CO-3: Evaluate sustainable building design principles and apply them in construction projects.
- CO-4: Integrate technology and data management strategies for efficient civil engineering project execution.
- CO-5: Implement innovative technologies to enhance civil engineering project efficiency.
- CO-6: Utilize advanced tools for effective monitoring and management of civil engineering projects.

TEXT-BOOK AND REFERENCE BOOKS:

1. Sanjay Sharma, "Introduction to Industry 4.0: A Practical Approach to Understanding Industry 4.0 Concepts and Technologies", CRC Press, 2019
2. Karen Kensek, "Building Information Modeling (BIM) in Civil Engineering", Wiley, 2017
3. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", Wiley, 2016
4. Rajat Gupta, "Emerging Technologies in Civil Engineering: Advances in Remote Sensing, IoT, and Robotics", Springer, 2020

					Industry 4.0 Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To understand applications of Industry 4.0 technologies through case studies and videos.
2. To learn BIM software for project design, practice 2D and 3D rendering techniques.
3. To learn QGIS software for remote sensing applications like land cover mapping.
4. To gain hands-on experience in drone flight and control and data analysis.

UNIT I : INTRODUCTION AND BASIC CONCEPTS OF INDUSTRY 4.0

4 Hrs.

Case Studies and Videos on Big data, Advanced Robotics, Simulation, Integration, Internet of Things (IoT), Artificial Intelligence (AI), Cybersecurity, Cloud computing, Additive manufacturing, Augmented Reality.

UNIT II : BUILDING INFORMATION MODELLING APPLICATIONS

6 Hrs.

BIM software and tools for project design, 2 D, 3D Rendering. Application of BIM in civil engineering projects, including project planning, scheduling, and tracking. Case-based learning about building materials and techniques. Simulation exercises using tools like EnergyPlus and Designbuilder for sustainable building design, Incorporating innovative construction materials for sustainability.

UNIT III: EMERGING TECHNOLOGIES IN CIVIL ENGINEERING

4 Hrs.

QGIS software for remote sensing applications like land cover mapping and climate change analysis, Demonstrations of drone flight and control for data collection and analysis in civil engineering projects.

TOTAL HOURS: 14 Hrs.

COURSE OUTCOMES:

- CO-1: Understand and apply Industry 4.0 technologies through case studies and videos.
- CO-2: Utilize BIM software for project design, including 2D and 3D rendering.
- CO-3: Implement BIM in civil engineering projects for planning and tracking.
- CO-4: Use simulation tools for sustainable building design and innovative materials.
- CO-5: Apply QGIS for remote sensing applications like Land Cover Mapping and Climate Change Analysis.
- CO-6: To learn about drones for data collection in civil engineering.

TEXT-BOOK AND REFERENCE BOOKS:

1. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Wiley, 2016.
2. Willem Kymmell, "Building Information Modelling: Planning and Managing Construction Projects with 4D CAD and Simulations", McGraw-Hill, 2008.
3. Paul Bolstad, "GIS Fundamentals: A First Text on Geographic Information Systems", Eider Press, 2016.
4. Micahel Chasen, "Drone Mapping for Civil Engineering", CRC Press, 2020.

					Fluid Mechanics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	4	5	25	50	25	--	--	100

COURSE OBJECTIVES

1. To learn the fundamentals concepts of fluid mechanics
2. To established relevance of fluid mechanics with civil engineering
3. To learn the concepts of fluid and its properties
4. To learn the concepts of fluid flows and properties

UNIT I: FUNDAMENTALS OF FLUID MECHANICS

14 Hrs.

Properties Of Fluid: Introduction of Fluid Mechanics, Properties of Fluid – Density, Specific Gravity, Viscosity, Compressibility, Bulk Modulus, Surface Tension, Capillarity. Pressure Measurement: Pascal's Law, Pressure Measurement – Manometers. Hydrostatic Forces: Total Pressure and Centre of Pressure – Vertical Plane surface, Horizontal Plane Surface, Inclined Plane Surface, Curved Surface and Lock Gates. Buoyancy: Buoyancy, Metacentre and Metacentric Height - Determination, Equilibrium Conditions

UNIT II: FLUID KINEMATICS AND DYNAMICS

14 Hrs.

Fluid Kinematics: Introduction, Types of Flow, Continuity Equation – Three Dimensions and Cylindrical Co-ordinates, Velocity and Acceleration, Velocity Potential Function and Stream Function, Vortex Flow. Fluid Dynamics: Introduction, Euler's and Bernoulli's Equation, Practical Application of Bernoulli's Equation – Venturimeter, Orifice Meter and Pitot Tube, Momentum Equation, Free Liquid Jets.

UNIT III: VISCOUS AND TURBULENT FLOW

14 Hrs.

Viscous Flow: Introduction, Flow of Viscous Fluid – Circular pipe and Parallel Plates, Correction Factors, Power Absorbed in Viscous Flow, Loss of Head due to Viscous Flow, Coefficient of Viscosity. Turbulent Flow: Introduction, Reynolds Experiment, Friction Loss in Pipe Flow, Shear Stress in Turbulent Flow.

UNIT IV: PIPE FLOW

14 Hrs.

Introduction, Energy Loss due to Friction, Minor Energy Losses, HGL and TEL, Flow Through Syphon, Flow Through Pipes – Series, Compound, Equivalent, Parallel, Pipe Network – Hardy Cross Method.

TOTAL HOURS: 56 Hrs.

COURSE OUTCOMES:

- CO1 : Remember the Fundamental Concepts of Fluid Mechanics.
CO2 : Understanding of the Behavioural Aspects of Fluid in Different Conditions.
CO3 : Understanding and Classification of Fluid in Various Categories.
CO4 : Develop a Relationship Between Properties of the Fluid.
CO5 : Apply and Solve the Numerical Solution for the Problems of Fluid Mechanics.
CO6 : Compare and Conclude the Aspect of Fluid Mechanics for Problem Solving Skills.

TEXT-BOOK AND REFERENCE BOOKS:

1. Dr. R K Bansal, "A textbook of fluid mechanics and hydraulic machines", Laxmi Publishers, New Delhi, 2015.
2. Dr. A K Jain, "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, New Delhi, 2015.
3. R K Rajput, "A textbook of fluid mechanics", S. Chand Publishers, 2013.
4. S Ramamrutham, "Hydraulics fluid mechanics and fluid machines", Dhanpat Rai Publishers, New Delhi, 2015.
5. P N Modi and S M Seth, "Hydraulics and fluid mechanics", Standard Book House Publishers, New Delhi, 2015.
6. R J Garde and A G Mirajgaoker, "Engineering fluid mechanics", Scitech Publishers, New Delhi, 2012.

					Fluid Mechanics Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To learn the fundamentals concepts of fluid mechanics.
2. To established relevance of fluid mechanics with civil engineering.
3. To learn the concepts of fluid and its properties.
4. To learn the concepts of fluid flows and properties.

LIST OF EXPERIMENTS

- 1 Viscosity measurement using Efflux Time for Oil (Only One Liquid)
- 2 Application of Reynolds Experiment for Identification of Flow
- 3 Application of Venturimeter and Orificemeter for Flow Measurement
- 4 Determination of Metacentric Height for Floating Body using Experimental Setup
- 5 Calculation of Head Loss (Friction Loss) for the Close Conduits
- 6 Determination of the Minor Losses incurred in the Pipe Assembly
- 7 Experimental Verification of Bernoulli's Theorem
- 8 Measurement of Flow Discharge in Open Channel Flume using Pitot Tube
- 9 Evaluate the Hydraulic Co-efficient for Orifice and Mouthpiece
- 10 Field Visit and Application of Experiment for Pipe Network Distribution

COURSE OUTCOMES:

- CO1 : Relate the Concepts of Fluid Mechanics for Understanding the Concepts
- CO2 : Apply the Concept of Fluid Mechanics for Verification of the Experimental Data
- CO3 : Illustrate the Concepts for Friction Losses in Fluid Mechanics
- CO4 : Examine the Experimental Data for Analysis of Losses within Experimental Set-up
- CO5 : Analyse the Fluid Properties Using Different Aspect and Methods
- CO6 : Conclude the Fluid Mechanics Concepts for Evaluation of the Field Data

TEXT-BOOK AND REFERENCE BOOKS:

1. Dr. R K Bansal, "A textbook of fluid mechanics and hydraulic machines", Laxmi Publishers, New Delhi, 2015.
2. Dr. A K Jain, "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, New Delhi, 2015.
3. R K Rajput, "A textbook of fluid mechanics", S. Chand Publishers, 2013.
4. S Ramamrutham, "Hydraulics fluid mechanics and fluid machines", Dhanpat Rai Publishers, New Delhi, 2015.
5. P N Modi and S M Seth, "Hydraulics and fluid mechanics", Standard Book House Publishers, New Delhi, 2015.
6. R J Garde and A G Mirajgaoker, "Engineering fluid mechanics", Scitech Publishers, New Delhi, 2012

					Engineering Geology and Soil Mechanics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	4	5	25	50	25	--	--	100

COURSE OBJECTIVES

1. To learn different elements of Engineering Geology such as Mineralogy, Petrology and Structural Geology.
2. To impart knowledge to classify the soil based on index properties subsequently find their engineering properties.
3. To understand the fundamental concepts of compaction, permeability, stress transformation, stress distribution, consolidation and shear strength of soils.

UNIT I: FUNDAMENTALS OF ENGINEERING GEOLOGY

14 Hrs.

Definition and scope of geology –Geological Timeline-Geological Earth Processes - Study of the rock forming minerals, properties - Classification of rocks - Description - Occurrence - Engineering properties - Structural geology: Dip, strike, folds, faults and joints-their engineering aspects - Case Studies

UNIT II: SOIL BASICS, INDEX PROPERTIES AND SOIL CLASSIFICATIONS

14 Hrs.

Soil formation - Clay mineralogy - Surface activity - Volume-weight relationships - Grain size distribution - Sieve analysis and hydrometer analysis - Consistency limits and their determination - Soil classification systems

UNIT III: COMPACTION, CONSOLIDATION AND STRESS DISTRIBUTION

14 Hrs.

Compaction – Moisture - density relations - Factors affecting compaction - Field compaction methods - Field compaction control - primary consolidation concept - void ratio - pressure curve - Field curve - Laboratory test - Vertical Stress distribution in soil - Boussinesq equation - line load - Uniformly distributed loads - Influence chart - approximate methods- Westergaard's equation - Pressure bulb

UNIT IV: PERMEABILITY, SEEPAGE AND SHEAR STRENGTH

14 Hrs.

One dimensional flow through soil - Permeability - Darcy's Law - Field and laboratory permeability tests - Flow through stratified soil - Seepage - Two dimensional flow - Laplace's equation – Introduction to flow nets - Shear Strength of soil - Importance - Mohr Coulomb's Strength theory - Laboratory and field tests - Factors affecting shear strength - Types of shear tests based on drainage condition

TOTAL HOURS: 56 Hrs.

COURSE OUTCOMES:

- CO-1 : Explain geological earth processes in formation of soils, rock, mineralogy, structural features
- CO-2 : Develop interrelations between index properties of soils
- CO-3 : Classify the soil based on Index properties of soils
- CO-4 : Apply principles of compaction and consolidation to the control field conditions
- CO-5 : Demonstrate the concept of stress distribution and shear strength of soils
- CO-6 : Compute permeability and seepage for different soils and hydraulic structures

TEXT-BOOK AND REFERENCE BOOKS:

1. BC Punmia, Ashok Kumar Jain, Arun Jain, **"Soil Mechanics and Foundations"**, Laxmi Publication.
2. KR Arora, **"Soil Mechanics and Foundation Engineering"**, Standard Publisher Dist.
3. Parbin Singh, **"Engineering and General Geology"**, S.K. Kataria & Sons.
4. Shashi Gulathi, Manoj Dutta, **"Geotechnical Engineering"**, Tata Mcgraw Hill Publisher.

					Engineering Geology and Soil Mechanics Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To discriminate rock forming minerals and different types of rocks
2. To interpret topographical and geological map
3. To determine index and engineering properties of soils

LIST OF EXPERIMENTS

1. Study and identification of rocks and rock forming minerals
2. Determination of moisture content and specific gravity of fine-grained soils
3. Determination of field density using core cutter method
4. Determination of field density using sand replacement method
5. Determination of liquid limit and plastic limit of soils
6. Grain size analysis of soils
7. Determination of maximum dry density and optimum moisture content using standard Proctor test
8. Determination of relative density of sandy soils
9. Determination of permeability of soils using (i) constant head (ii) falling head permeability test
10. Determination of compressibility of soil using consolidation test
11. Determination of shear strength parameters of soil by direct shear test
12. Determination of unconfined compressive strength of soil
13. Lab based project

COURSE OUTCOMES:

CO-1: Identify minerals and rock

CO-2: Determine field density and compaction properties of soil

CO-3: Classify the soil based on the index properties and physical characteristics

CO-4: Determine the shear strength parameters of soil

CO-5: Determine the permeability of soil

CO-6: Evaluate the compressibility characteristics of soil

TEXT-BOOK AND REFERENCE BOOKS:

1. Laboratory Manual
2. BC Punmia, Ashok Kumar Jain, Arun Jain, **"Soil Mechanics and Foundations"**, Laxmi Publication, 16th Edition, 2015.
3. KR Arora, **"Soil Mechanics and Foundation Engineering"**, Standard Publisher Dist., 2009.
4. Parbin Singh, **"Engineering and General Geology"**, S.K. Kataria & Sons, 2014.
5. Shashi Gulathi, Manoj Dutta, **"Geotechnical Engineering"**, Tata Mcgraw Hill Publisher, 2009.

					Surveying Practices					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	4	5	25	50	25	--	--	100

COURSE OBJECTIVES

1. To understand the principles and procedure for linear, angular measurement and levelling
2. To study the various advanced surveying techniques for civil engineering.
3. To understand area and volume measurement with surveying techniques.
4. To utilization of Remote sensing, GIS techniques in construction activities.

UNIT-1: INTRODUCTION BASIC SURVEYING

14 Hrs.

Linear survey, linear measurements using chains and tapes, chaining and ranging errors and corrections, procedure of field work, angular survey introduction, WCB and QB, computation of angles from bearings, local attraction and corrections, principle of levelling, methods of levelling, curvature and refraction corrections, contouring, methods of contouring, uses of contour maps.

UNIT-2: TRIANGULATION AND CURVE SETTING

14 Hrs.

Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control – methods. Elements of simple, compound, and Reverse curves, Method of setting out simple circular curve, Computation of area of regular and irregular boundary computation of volume for earthwork in cutting & filling.

UNIT-3: MODERN FIELD SURVEY SYSTEMS

14 Hrs.

Principle of Electronic Distance Measurement, Modulation, Types of EDM instrument modern surveying equipment, Total Station - Parts, Accessories, Advantages and Applications, land surveying with total stations, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

UNIT-4: ADVANCE SURVEYING TECHNIQUES

14 Hrs.

Principles of Remote Sensing, Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere, sensors and platforms, concept of resolution, photogrammetry, drone and UAV survey, GIS introduction, GIS data types, GIS data sources, cartography, GIS applications, Introduction of QGIS in Advanced surveying, applications of GIS in Civil Engineering.

TOTAL HOURS: 56 Hrs.

COURSE OUTCOMES:

- CO1 : Define the basic principles of linear, angular, and levelling
- CO2 : Illustrate the application of theodolite, auto level, and total station.
- CO3 : Examine and measure the area and volume of a given field.
- CO4 : Demonstrate the basic working of Tacheometry.
- CO5 : Analyze the uses of modern tools and mapping methods in survey projects.
- CO6 : Develop the working knowledge of Remote Sensing, GIS, and GPS for Surveying and mapping

TEXT-BOOK AND REFERENCE BOOKS:

1. NN Basak, “**Surveying and Levelling**”, 2nd Edition, Tata McGraw Hill Publication, New Delhi.
2. BC Punmia, “**Surveying Vol. I**”, 17th Edition, Laxmi Publishing House, New Delhi
3. Madhu, N, Sathikumar, R and Satheesh Gobi, “**Advanced Surveying: Total Station, GIS and Remote Sensing**”, Pearson India, 2006.
4. Haywood L, Cornelius S and S Carver, “**An Introduction to Geographical Information Systems**”, Addison Wiley Longmont, New York.
5. Anji Reddy, M., “**Remote sensing and Geographical information system**”, B.S. Publications, 2001

					Surveying Practices Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	02	--	--	--	50	50	100

COURSE OBJECTIVES

1. To learn the usefulness of traditional survey methods through chain, tape, and compass survey
2. To gain knowledge by learning theodolite and total station for elevation calculation and contours.
3. To learn GPS and GPS based data point mapping for engineering.
4. To understand the GIS application in civil engineering survey and mapping.

LIST OF EXPERIMENTS

- 1 To conduct the linear measurement using the chain and offset method
- 2 To measure a linear and angular distance using Chain and Compass Survey
- 3 To conduct profile levelling along a road.
- 4 To prepare contour maps by Grid methods
- 5 To measurement the horizontal and vertical angles with total station
- 6 To determining the area of irregular boundary with planimeter.
- 7 To setting out a simple circular curve.
- 8 To conduct the advance survey using Global Positioning System (Point, Line, and Area)
- 9 To study the advance software techniques for map preparation with GIS.
- 10 Project 1: Calculating Cross-sectional Areas of Road Formations.
- 11 Project 2: Computing Volumetric Quantities of Earthwork along a Road Alignment
- 12 Project 3: Catchment delineation with QGIS
- 13 Project 4: Drone survey and data processing
- 14 Project 5: Drone flying simulator.

COURSE OUTCOMES:

- CO1 : Explain the usefulness of traditional survey methods through chain, tape, and compass.
- CO2 : Make use of Auto level for levelling survey.
- CO3 : Determining vertical and horizontal angles with theodolite/total station.
- CO4 : Design and layout the simple circular curve on field.
- CO5 : Illustrate the application of GPS and GIS on field survey.
- CO6 : Demonstration mapmaking skills with GIS data.

TEXT-BOOK AND REFERENCE BOOKS:

1. NN Basak, **“Surveying and Levelling”**, 2nd Edition, Tata McGraw Hill Publication, New Delhi.
2. Madhu, N, Sathikumar, R and Satheesh Gobi, **“Advanced Surveying: Total Station, GIS and Remote Sensing”**, Pearson India, 2006.
3. Haywood L, Cornelius S and S Carver, **“An Introduction to Geographical Information Systems”**, Addison Wiley Longmont, New York.

					Structural Analysis					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	-	-	100

COURSE OBJECTIVES

1. Attain proficiency in employing various structural analysis methods to solve complex engineering problems.
2. Apply fundamental theorems and concepts of structural analysis to assess the behavior of different structural systems.
3. Enhance problem-solving abilities by analyzing and interpreting structural responses under different loading conditions.

UNIT I: Strain Energy, Deflections and Two hinged arches

13 Hrs.

Stability and Determinacy of Structure Statically determinate and indeterminate structures by force/ energy methods; Method of superposition, Plane Trusses, Deflection of Trusses. Deflections of beam and frame. Introduction to arches.

UNIT II: ILD, moving loads and consistent deformation

13 Hrs.

Influence Line Diagrams for reaction, shear force and bending moments of statically determinate beams. Maximum bending moments and shear forces at specified sections due to static and moving loads. Consistent deformation method/Method of least work: Analysis of single span beams with various loading and boundary conditions

UNIT III: Slope deflection method

15 Hrs.

Fixed beams analysis for end moments and introduction to continuous beams, Slope deflection method: Introduction, Sign convention, Development of slope-deflection equations and Analysis of beams and orthogonal rigid jointed plane frames (non-sway and sway analysis)

UNIT IV: Moment distribution method

15 Hrs.

Moment Distribution Method: Introduction, Definition of terms-Distribution factor, Carry over factor, Development of method and Analysis of beams and orthogonal rigid jointed plane frames (non-sway and sway analysis)

Total Hours 56 Hrs.

COURSE OUTCOMES:

- CO-1: Determine slopes and deflection using strain energy, unit load method
CO-2: Analyze beams and arches and trusses using Castigliano's theorems, method of least work or consistent deformation
CO-3: Draw ILD for statically determinate beam
CO-4: Compute max BM and SF for moving loads
CO-5: Analyze the statically indeterminate beams and simple frames using Slope deflection method
CO-6: Analyze the statically indeterminate beams and simple frames using moment distribution method

TEXT-BOOK AND REFERENCE BOOKS:

1. Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill, New Delhi.
2. R.C.Hibbeler, "Structural Analysis, sixth Edition", Pearson publications, New Dehli
3. S.B.Junnarkar & H J Shah, "Mechanics of Structures", Volume I, Charotar publishing house, Anand
4. Thandava Murthy, "Analysis of Structures", Oxford University Press.
5. S Ramamrutham, "Theory of structures", Dhanpat rai Publications, New Delhi.

					Hydrology and Water Resources Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

1. To understand the basic component of hydrology
2. To understand the fundamentals of Ground water hydrology
3. To understand the basic concept of reservoir operation and irrigation techniques
4. To understand the case application of modeling techniques in water resources engineering

UNIT I : INTRODUCTION TO COMPONENT OF HYDROLOGY

14 Hrs.

Introduction - Hydrologic Cycle, Precipitation, Types - Measurement – Rain Hyetograph and Mass Curve - DAD – IDF curve - Run Off - Evaporation Losses, Infiltration: Process-Capacity-Rate-Capacity Curve-Indices -Computation of Runoff- Unit hydrograph, Flood hydrograph, S-Curve Hydrograph.

UNIT II : GROUND WATER HYDROLOGY

10 Hrs.

Definition – Occurrence - Zone and Movement of GW - GW Yield - Aquifers and their Types - Thiem's and Dupuit's formulas - Efficiency of Well - Infiltration Galleries and Well - Introduction to Open and Tube Well.

UNIT III : RIVER TRAINING AND RESERVOIR PLANNING

12 Hrs.

Introduction - Different type of river - classification of Indian river - mender parameters and their relationships – objective of river training Classification of river training work- Reservoir – River Capacity and Diversion Channel - Reservoir Planning, Definition and Types - Capacity-Elevation and Area-Elevation Curve - Storage Zones - Catchment and Reservoir Yield, Reservoir Capacity and Methods of Finding – Hydrologic Reservoir Routing and Methods - Reservoir Sedimentation, Reservoir Losses.

UNIT IV: MODELING TECHNIQUES IN WATER RESOURCES ENGINEERING

06Hrs.

Introduction of model - Types of models, Introduction of Hydrologic and Hydrodynamic model - Different Case applications of modelling in water resources engineering. Drone application in water resource engineering.

TOTAL HOURS: 42 Hrs.

COURSE OUTCOMES:

- CO-1: Define the basic components of hydrology cycle.
- CO-2: Define the basics of Ground water hydrology.
- CO-3: Evaluate components of hydrologic cycle.
- CO-4: Classify the various river and reservoir systems for water resources management.
- CO-5: Analyze different surface and subsurface components of hydrology.
- CO-6: Elaborate the utility of various models in water resources engineering.

TEXT-BOOK AND REFERENCE BOOKS:

1. S.K. Garge, “**Hydrology and Water Resources Engineering**”, Khanna publishers, New Delhi.
2. H.M. Raghunath, “**Ground Water**”, Wiley publishers, New Delhi.
3. K. R. Arora, “**Irrigation, Water Power and Water Resources Engineering**”, Standard publishers, Delhi.
4. P. J. Rami Reddy, “**Hydrology**”, Laxmi publishers, New Delhi.

					Hydrology and Water Resources Engineering laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To understand the basic component of hydrology
2. To understand the fundamentals of Ground water hydrology
3. To understand the basic concept of reservoir operation and irrigation techniques
4. To understand the case application of modeling techniques in water resources engineering

LIST OF EXPERIMENTS

- 1 To measure the rainfall using the Tipping bucket rain-gauge.
- 2 To calculate an average rainfall using graphical (Thiessen Polygon) Method.
- 3 To estimate the rate of evaporation using Pan Evaporimeter.
- 4 To estimate the rate of infiltration using single and double ring infiltrometer. .
- 5 To measure the velocity using the current meter.
- 6 To calculate the area of irregular boundary using a planimeter- A case of reservoir.
- 7 To study the hydraulic jump.
- 8 To study the various software for drainage delineation.
- 9 To study the various software for watershed delineation.
- 10 To study drone (UAV) for DEM/DTM generation – A case of 1D and 2D hydraulic modeling

COURSE OUTCOMES:

CO-1: Understand the basic components of hydrology cycle.

CO-2: Calculate the various hydrologic component through experiment.

CO-3: Evaluate area-volume using planimeter.

CO-4: Classify the river flow using hydraulic flume.

CO-5: create the watershed and drainage using a software techniques.

CO-6: Create a DEM/DSM using Drone (UAV) techniques for hydraulic modeling.

TEXT-BOOK AND REFERENCE BOOKS:

1. S.K. Garge, “**Hydrology and Water Resources Engineering**”, Khanna publishers, New Delhi.
2. H.M. Raghunath, “**Ground Water**”, Wiley publishers, New Delhi.
3. K. R. Arora, “**Irrigation, Water Power and Water Resources Engineering**”, Standard publishers, Delhi.
4. “**2D Modeling User’s Manual**”, HEC-RAS River Analysis System, US Army Corps of Engineers.

					Foundations and Geotechnical Applications					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	4	3	25	50	25	--	--	100

COURSE OBJECTIVES

1. To emphasize the importance of geotechnical investigation and subsoil exploration techniques.
2. To explain the importance of earth pressure and slope stability in geotechnical structures.
3. To compute bearing capacity for various foundation systems, including settlement considerations.
4. To explain the suitability of appropriate foundation systems for various site conditions and their analysis.

UNIT I: SUBSOIL EXPLORATION AND GEOTECHNICAL INVESTIGATION

10 Hrs.

Objective, Subsurface exploration planning, Exploration methods, Soil sampling and samplers, In-situ tests, Geophysical exploration, Geotechnical investigation report, Problems and solutions.

UNIT II: EARTH PRESSURE THEORIES AND STABILITY OF SLOPES

12 Hrs.

Introduction, Types of earth pressures, Rankine's theory, Surcharge, Inclined backfill, Soil stratification, Graphical methods, Application problems, and solutions, Types of slopes, Causes of failure, Stability analysis of infinite and finite slopes, Types of failures, slip circle method, friction circle method, Taylor's stability number and stability of curves.

UNIT III: BEARING CAPACITY AND FOUNDATION SETTLEMENT

10 Hrs.

Definitions, Types of failures, Terzaghi's analysis, Skempton's formula, IS formula, Effect of water table on bearing capacity, Shape of foundation, Inclination of load and eccentricity of load on bearing capacity, Allowable bearing pressure, Plate load test, Penetration tests, Settlement of foundation: Settlement analysis, Types of foundation settlements, Components of settlements and their estimation, Allowable settlement values, Effects, causes and remedial measures of total and differential settlements.

UNIT IV: SHALLOW AND DEEP FOUNDATIONS

10 Hrs.

Shallow foundations, Stress distribution (theory only): Rectangular combined footing, Trapezoidal combined footing, Raft footing, IS code of practice, Deep foundations, Functions of piles and their classification, Relative merits, Load carrying capacity of piles, Static and dynamic formula, Pile load test, Penetration tests, Pile spacing and group action, Design of pile group, Settlement of pile group. Negative skin friction, Under reamed pile, Load carrying capacity of pile group.

TOTAL HOURS: 42 Hrs.

COURSE OUTCOMES

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

- CO-1: Develop a subsurface investigation program.
- CO-2: Calculate the earth pressure for different field conditions and soils.
- CO-3: Analyze the stability of soil slopes.
- CO-4: Compute the bearing capacity of foundations and foundation settlements.
- CO-5: Analyse shallow foundations.
- CO-6: Analyze deep foundations.

TEXT-BOOK AND REFERENCE BOOKS:

1. B.C.Punmia, Ashok Kumar Jain, Arun Jain, "Soil Mechanics and Foundations", Laxmi Publications.
2. K.R. Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers.
3. Shashi Gulathi, Manoj Dutta, "Geotechnical Engineering", McGraw Hill Education.
4. Bowles J.E., "Foundation Analysis and Design", McGraw-Hill Education.
5. Gopal Ranjan, Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Pvt. Ltd.

					Foundations and Geotechnical Application Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	25	25	50

COURSE OBJECTIVES

1. To determine engineering properties of soils in the context of foundation design
2. To understand the soil exploration techniques
3. To determine in-situ parameters of soils by field test

LIST OF EXPERIMENTS

1. Determination of free swell index and swelling pressure of soil
2. Determination of CBR value of soils
3. Determination of shear strength parameters using triaxial compression test (undrained)
4. Determination of shear strength of soft soils using vane shear test
5. Determination of bearing capacity of foundation using plate load test
6. Demonstration of soil exploration and SPT, CPT test
7. Electrical resistivity of soils
8. Dynamic cone penetration test
9. Analysis of slope stability and bearing capacity of foundations
10. Laboratory based projects

COURSE OUTCOMES

- CO-1: Determine free swell index and swelling pressure of soil
- CO-2: Determine CBR value of soils
- CO-3: Evaluate shear strength of soil.
- CO-4: Interpret in-situ parameters conducting SPT, DCPT
- CO-5: Determine bearing capacity parameters using plate load test
- CO-6: Interpret field properties using geophysical test

TEXT-BOOK AND REFERENCE BOOKS:

1. Laboratory Manual
2. B.C.Punmia, Ashok Kumar Jain, Arun Jain, "Soil Mechanics and Foundations", Laxmi Publication
3. K.R. Arora, "Soil Mechanics and Foundation Engineering", Standard Publisher Dist.
4. Parbin Singh, "Engineering and General Geology", S.K. Kataria & Sons
5. Shashi Gulathi, Manoj Dutta, "Geotechnical Engineering", Tata Mcgraw Hill Publisher

					Design of RCC Structures					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES:

1. Understand the basics of structural design for reinforced concrete structures, including strength, stability, and serviceability, stress-strain curves, stress block.
2. Learn Limit State design methods and their advantages over other design philosophies like Ultimate Load and Working Stress methods. Beam classification based on reinforcement configurations.
3. Design reinforced concrete structural members, such as beams, slabs, staircases, columns, and footings, for various loading conditions according to Indian Standard codes.

UNIT I : INTRODUCTION

10 Hrs.

Introduction - Introduction and scope - Design: strength – stability – serviceability - Design methods - Ultimate load method - working stress method - Limit state method - Standard Loadings - Partial safety factors for materials and loads – Grades of concrete - characteristic strength of concrete - yield strength of mild and Tor steels - Analysis of RC Beams (flexural members) - Stress-Strain curve for concrete - stress block for RC beam section - Classification of Beams based on reinforcement and depth of neutral axis - Moment resistance of RC-rectangular

UNIT 2 DESIGN OF RCC BEAMS

10 Hrs.

Design of RC-beams - Rectangular - T and L beams for under- reinforced and balanced sections - & singly and doubly reinforced - Design of shear reinforcement - check for development length and deflection

UNIT 3 DESIGN OF RCC SLABS AND STAIRCASE

10 Hrs.

Design of slabs - Design of one way, two-way and cantilever slabs for flexure and check for shear deflections Design Staircase - Types of Staircase – components – landing – going – tread – rise – loading – geometry - load calculations - Design of Dog legged staircase

UNIT VI: DESIGN OF COMPRESSION MEMBERS AND FOOTING

12 Hrs.

Design of Compression Members - Effective lengths, slenderness ratio, Short and long columns definitions - Design of short columns subjected to axial load - uni-axial bending and biaxial bending moments Design of Footing - SBC of soil - design of flat and sloped square - rectangular and circular footings for RC columns subjected to axial load - uniaxial and biaxial bending moments - Check for shear

MAX. 42 Hrs.

COURSE OUTCOMES:

- CO-1: Recall the fundamental principles of RCC structure design.
CO-2: Design RCC beams, including Rectangular, T, and L beams.
CO-3: Proficiency in designing RCC slabs for flexure and shear deflections.
CO-4: Design of staircases, considering components, geometry, and loading requirements.
CO-5: Competence in designing compression members.
CO-6: Demonstrate the ability to design various types of isolated footings.

TEXT-BOOK AND REFERENCES BOOKS:

1. P.C.Vergese, “Limit State Design of Reinforced Concrete”, PHI Publications, New Delhi
2. N Krishna Raju, “Design of Reinforced Concrete Structures”, CBS Publishers New Delhi
3. Ramamrutham, “Design of Reinforced Concrete Structure”, Dhanpat & Roy Publishers, New Delhi.
4. Shah H.J, “Reinforced Concrete Volume-I”, Charotar Publication House Pvt .Ltd

5. V L Shah, S R Karvem, **“Limit State Theory & Design of Reinforced Concrete”**, (I.S. 456 - 2000) Standard Publishers Distributors
6. **“IS: 456-2000, Indian Standard Plain and Reinforced Concrete Code of Practice”**, Bureau of Indian Standards, New Delhi
7. **“SP:16(6)-1980, Design Aids for Reinforced Concrete to IS: 456-1978”**, Bureau of Indian Standards, New Delhi

					Computer Aided Design Drawing Laboratory - I					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	00	00	00	50	50	100

COURSE OBJECTIVES:

1. To familiarize students with drafting tools for creating plans, elevations, and sections of residential buildings
2. To introduce students with Finite Element Method (FEM) software for analysis and design RCC structures.
3. To gain familiarity with bar bending schedules, layout and detailing of structural drawings

UNIT I : DRAWING OF RESIDENTIAL BUILDING

08 HRS

Familiarising basic commands of drafting software To draw plan, elevation of a residential buildings using drafting software. To draw sectional elevation of the building specified in the above item using drafting software.

UNIT II : INTRODUCTION TO FEM SOFTWARE

06 HRS

Introduction to FEM Software Pre-processing- developing models of simple structural member like simple and continuous beams, 2D trusses and 2D frames-Defining material properties-Application of boundary conditions like roller, hinged, fixed, partially restrained supports -Application of loads like point load, distributed load and concentrated moments, handling editor files. Processing running the simulations, and handling the errors and warnings Post-Processing reading the results, critical internal forces, plotting shear force diagrams, bending moment diagrams, axial force diagrams and torsional moments diagrams.

UNIT III : DESIGN OF RESIDENTIAL BUILDINGS USING FEM SOFTWARE

06 HRS

Analysis and Design of Residential Buildings Structural Structures as Per IS 456, IS 1893
Developing/Importing model of G+2 building. Defining material properties-Application of boundary conditions, Partially and fully releasing the moments -Application of loads as Per IS 456, IS 1893, defining load combinations. Defining design parameters and assigning design commands. Performing the analysis, reading the results

UNIT VI : DRAWING OF REINFORCED CONCRETE STRUCTURES

10 HRS

Prepared typical layout drawings for various structural member like footing, column, beams, slabs with appropriate notations system. To draw longitudinal and cross sections of three span continuous beam showing the reinforcement details. To draw plan and sectional elevation of simply supported one way and two-way slabs showing the reinforcement details. To draw plan and sectional elevations of rectangular column with rectangular footings. To draw plan of the staircase room and sectional elevations of flights showing reinforcement details

MAX. 32 HRS

COURSE OUTCOMES

- CO-1: Demonstrate proficiency in using drafting software tools to create building drawing.
- CO-2: Create finite element models of simple structural members such as beams, trusses, and frames using FEM software.
- CO-3: Demonstrate proficiency in using FEM software as a tool for structural analysis and design.
- CO-4: Apply relevant design codes and standards (IS 456, IS 1893) in the analysis and design process
- CO-5: Utilize analysis results to assess structural performance and make informed design decisions
- CO-6: Demonstrate professionalism in technical drawing practices, including adherence to standards and conventions

TEXT-BOOK AND REFERENCES BOOKS:

1. "2D CAD Drawing User's Manual", Autodesk, US.

					DESIGN OF STEEL STRUCTURES					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

1. To understand the design the various types of bolted connections used in steel structures
2. To study various types of welded connections and concept of design of tension members
3. To understand the concepts and procedure for design of the simple and composite columns including column base and gusseted base.
4. To understand procedure to design laterally supported and unsupported steel I beams

UNIT I : BOLTED CONNECTIONS

10 Hrs.

Introduction to steel structures and steel code provisions, scope of the subject, types of connections . Bolted connections: types bolts, specification, permissible values, Butt and lap connections of steel plates or flats, numerical examples. Beam to beam connections numerical examples. Beam to column connections: Connections subjected axial load and twisting moments, numerical examples. Beam to column connections: Connections subjected axial load and bending moments, numerical examples

UNIT II : WELDED CONNECTIONS AND TENSION MEMBERS

10 Hrs.

Introduction to welded connections: Butt and lap welded connections of steel plates or flats, numerical examples. Beam to column welded connections: Connections subjected axial load and twisting moments, numerical examples. Beam to column welded connections: Connections subjected axial load and bending moments, numerical examples. Design of tension members using angle, double angle, T and L rolled steel members, lug angle, numerical examples

UNIT III : COMPRESSION MEMBERS AND COLUMN BASES

10 Hrs.

Design of compression members using I and Channel sections, Compound column design using double channel sections, numerical examples. Compound column design using lattice connections, numerical examples. Design of column splice of various types using numerical examples. Design of column base and gusseted base concept and numerical examples

UNIT IV : LATERALLY SUPPORTED AND UN-SUPPORTED BEAMS

12 Hrs.

Design of beams using I sections, design principles, code provisions. Design of laterally supported beams subjected to uniformly distributed loads, design procedure, design numerical examples. Design of laterally un supported beams subjected to uniformly distributed loads, design procedure, code provisions design numerical examples.

TOTAL HOURS:42 Hrs.

COURSE OUTCOMES

- CO-1: Design the bolted concentric and eccentric connections
- CO-2: Design the welded concentric and eccentric connections
- CO-3: Design the tension members
- CO-4: Design the simple and compound compression members.
- CO-5: Design column base and gusseted base
- CO-6: Design laterally supported and unsupported beams.

TEXT-BOOK AND REFERENCE BOOKS:

1. K.S. Sai Ram, “**Design of Steel Structures**”, Pearson Publication, Delhi
2. Subramanian N., “**Design of Steel Structures**”, Oxford University press, New Delhi.
3. Duggal S.K., “**Limit State method of design of steel structures**”, Tata McGraw-Hill, New Delhi
4. Arya A.S and Ajmani J.L, “**Design of Steel Structures**”, Nemchand Bros., Roorkee.
5. “**IS 800-2007: General construction in steel-Code of practice (third revision)**”, Bureau of Indian Standards, New Delhi.
6. Steel Table

					COMPUTER AIDED DESIGN DRAWING LABORATORY - II					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To illustrate bolted and welded connections
2. To illustrate lapped connections and column base connections
3. To understand and draw beam connections.

LIST OF EXPERIMENTS

- 1 Understand basic commands of drafting software
- 2 Beam to beam bolted and welded connections
- 3 Beam to column bolted and welded connections
- 4 Beam to beam welded connections
- 5 Beam to column welded connections
- 6 Bolted or welded Butt and lap connections
- 7 Column splice connections
- 8 Single and double lacing or Batten connections in compound columns
- 9 Column base and gusseted base connections
- 10 Simply supported or cantilever truss drawing
- 11 Understand basic commands of FEM software
- 12 Analysis of Truss using FEM Software
- 13 Analysis of Industrial building frame using FEM software

COURSE OUTCOMES

- CO-1: Explain basic commands of drafting software
- CO-2: Draft beam to beam or Beam to column connections
- CO-3: Construct the butt, lap and column splice connections
- CO-4: Draw lacing, batten and column base connections in compound columns
- CO-5: Construct drawings of simply supported or cantilever Truss
- CO-6: Analyse Truss or industrial building frame using FEM software

TEXT-BOOK AND REFERENCE BOOKS:

1. N Krishnaraju, **"Structural Design and Drawing"**, University press
2. C.S.Krishna Murthy & Rajiv S. – Computer Aided Design, software & Analytical tools - Narasha publishing house India.
3. K.S. Sai Ram, **Design of Steel Structures**, Pearson Publication, Delhi
4. Subramanian N., **"Design of Steel Structures"**, Oxford University press, New Delhi.

					Environmental Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	4	5	25	50	25	--	--	100

COURSE OBJECTIVES

1. Understanding the various aspects of water - sources, quality, demands
2. Design of a Water Treatment Plant
3. Understanding the qualitative and quantitative aspects of wastewater
4. Design of a Wastewater Treatment Plant

UNIT I : DRINKING WATER

12 Hrs.

Water cycle, Sources of water, Water quality standards, Impact of water quality on - human health, agriculture, materials, etc. Water Demands types and estimation, Water Budget, Population Forecasting Methods.

UNIT II : WATER TREATMENT

16 Hrs.

Design of Screens, Types of settling and settling tests, Design of Sedimentation Tank, Coagulation: mechanisms of coagulation, Mixing and Flocculation, Design of clariflocculator, Filtration: Slows sand filters, rapid sand filters, Water Softening, Water Disinfectioning, Action plan for efficient plant operation

UNIT III : WASTEWATER

12Hrs.

Classification of wastewater, Composition of wastewater, Characterization of wastewater (physical, chemical and biological), basics of sewage quality assessment, sources of wastewater, estimation of wastewater quantity.

UNIT IV : WASTEWATER TREATMENT

16Hrs.

Significance of wastewater treatment, objectives of a sewage treatment plant, classification of treatment processes, design of a sewage treatment plant - Screening, Grit Removal Basin, Skimming Tank, Sedimentation Tank, Secondary Treatment of sewage through (i) Biological Filtration of Sewage (ii) Activated Sludge Process, Disinfection of sewage and sludge, methods of disposal of treated Sewage along with their standards, Action plan for efficient plant operation.

TOTAL HOURS 56 Hrs.

COURSE OUTCOMES

- CO1 – Estimate the present and future needs of water of a city
CO2 – Design a Water Treatment Plant
CO3 – Propose measures for efficient functioning of a water treatment plant
CO4 – Classify the wastewater and quantify its pollution load
CO5 – Design a Wastewater Treatment plant
CO6 – Propose measures for efficient functioning of a wastewater treatment plant

TEXT-BOOK AND REFERENCE BOOKS:

1. S. K. Garg, "**Water Supply Engineering (Environmental Engineering)**", Khanna Publishers, 2016
2. S K Garg, "**Sewage Disposal and Air Pollution Engineering**", Khanna Publishers, 2016 GS Birdie, JS Birdie, Water Supply and Sanitation Engineering, Galgotia Publishing Ltd
3. HS Paevy, DR Rowe, G Tchobanoglous, "**Environmental Engineering**", McGraw Hill
4. Metcalf and Eddy, "**Water and Wastewater Engineering**", McGraw Hill
5. Sawyer, C.N. and McCarty, P.L., and Parkin, G.F., "**Chemistry for Environmental Engineers**", 4th Edn. McGraw Hill, New Delhi, 1994.
6. Benefield, Judkins and Weand, "**Process Chemistry for Water and Wastewater Treatment**", Prentice Hall

					Environmental Engineering (Laboratory)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	0	0	0	50	50	100

COURSE OBJECTIVES

5. Understanding the sampling procedures for water and wastewater collection
6. Estimating the pollutants present in the Water through experimentation
7. Estimating the pollutants present in the Wastewater through experimentation
8. Analyze the Water and Wastewater quality based on the respective standards

DETAILS OF LABORATORY PRACTICALS:

1. Determination of pH, Turbidity
2. Determination of Alkalinity and Acidity
3. Determination of Total Solids, Total Dissolved Solids, Total Suspended Solids
4. Determination of Total Hardness and Calcium Hardness
5. Determination of Chlorides
6. Determination of Coagulant Dosage by Jar Test
7. Determination of Residual Chlorine
8. Determination of Dissolved Oxygen
9. Determination of BOD
10. Determination of COD
11. Project – 1 Assessment of the drinking water of the university campus / residential Building
12. Project – 2 Assessment of the treated wastewater of the university campus

COURSE OUTCOMES

- CO-1: Estimate the concentration of a pollutant present in the water
- CO-2: Analyze the quality of water based on water quality standards
- CO-3: Propose appropriate measures for improving the water quality
- CO-4: Estimate the concentration of a pollutant present in the wastewater
- CO-5: Analyze the quality of wastewater based on wastewater quality standards
- CO-6: Propose appropriate measures for improving the wastewater quality

TEXT-BOOK AND REFERENCE BOOKS:

1. Standard Methods for The Examination of Water and Wastewater (American Water Works Association), ISBN-9780875532875
2. Indian Standards (IS: 3025)
3. Indian Standards (IS: 10500-2012)

					Highway and Traffic Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	4	5	25	50	25	--	--	100

COURSE OBJECTIVES

1. To give an overview about highway engineering with respect to planning and alignment.
2. To know the importance of geometric design.
3. To learn the procedure and method of pavement design as per IRC.
4. To study the various traffic parameters and its estimation and design.

UNIT I : PRINCIPLES OF TRANSPORTATION ENGINEERING

12 Hrs.

Importance of transportation- Different modes of transportation and comparison-Characteristics of road transport- Road type's classification- road patterns- various road development plans in India- factors involved in alignment of new road link- planning surveys- Indian Roads Congress Guidelines.

UNIT II : HIGHWAY GEOMETRIC DESIGN

16 Hrs.

Importance of geometric design- Terrain classification- Design speed- Factors affecting geometric design, Cross sectional elements-Camber- width of pavement- Sight Distance design- Stopping sight distance- Overtaking sight distance overtaking zones- Examples on SSD and OSD- Sight distance at intersections- Horizontal alignment-Radius of Curve- Super elevation – Extra widening- Transition curve and its length- Setback distance – Examples, Vertical alignment-Gradient summit and valley curves.

UNIT III : PAVEMENT MATERIALS AND PAVEMENT DESIGN

16 Hrs.

Desirable properties and different test procedure of pavement materials (tests for soil, aggregate, bitumen etc.- Road construction methods- PAVEMENT DESIGN- Pavement types- component parts of flexible and rigid pavements and their Functions- design factors- ESWL and its determination- Flexible pavement- Design of flexible pavements as per IRC37-2018. Rigid pavement- Westergaard's equations for load and temperature stresses- Design of slab thickness only as per IRC: 58-2015. Different types of Flexible and Rigid pavement failures and pavement management methods

UNIT IV : TRAFFIC ENGINEERING

12 Hrs.

Various traffic parameters and its importance in the safe and efficient operation of highway. Traffic studies on flow and speed, peak hour factor, accident study, statistical analysis of traffic data; Microscopic and macroscopic parameters of traffic flow, fundamental relationships; Traffic signs; Signal design by Webster's method; Types of intersections; Highway capacity Introduction to Intelligent transportation- Different methods of ITS technologies developed for effective traffic operation and management.

TOTAL HOURS: 56 Hrs.

COURSE OUTCOMES

- CO-1: Describe various factors considered for planning and alignment of Highway.
- CO-2: Understand different geometric parameters and its importance in design.
- CO-3: Compute geometric parameters and can design highway components as per requirement.
- CO-4: Conduct different pavement materials tests and check suitability of construction material.
- CO-5: Design flexible and rigid pavement as IRC.
- CO-6: Create modern safe and efficient traffic network system.

TEXT-BOOK AND REFERENCE BOOKS:

1. L.R. Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.
2. Dr. S.K. Khanna and Dr. C.E. G. Justo, "Highway Engineering", Nem Chand & Bros., Roorkee.
3. S.K. Sharma, Principles, "Practice and Design of Highway Engineering", S. Chand & Co., New Delhi.
4. L.R. Kadiyali, "Traffic Engineering and Transport Planning", Khanna Publishers, New Delhi.
5. K P Subramaniam, "Transportation Engineering", Scitech Publications, Chennai
6. "IRC: 37-2018 Guidelines for Design of flexible Pavements", IRC.
7. "IRC: 67 Code of Practice for Road Signs", IRC, New Delhi – 2001.
8. "IRC: 58 - 2015: Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC.

					Highway and Traffic Engineering Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To know different test performed for aggregate and understand the procedure.
2. To know different test performed for Soil and understand the procedure.
3. To know different test performed for Bitumen and understand the procedure.
4. To know different traffic study methods

LIST OF EXPERIMENTS

- 1 Introduction to Highway Engineering Laboratory Equipment (Introduction class)
- 2 Aggregate crushing Test
- 3 Aggregate Impact Test
- 4 Flakiness Index and Elongation Index Test for Aggregate
- 5 Los Angeles Abrasion Test / Deval Abrasion Test
- 6 Specific gravity and Water Absorption test for Aggregate
- 7 Penetration test for Bitumen
- 8 Softening point test for Bitumen
- 9 Ductility test for Bitumen
- 10 Flash and Fire Point test for Bitumen
- 11 Specific gravity test for Bitumen
- 12 Viscosity Test for Bitumen
- 13 Marshall stability test on Bitumen mix
- 14 Conduct classified traffic volume study and spot speed study on busy rural highway or urban street during peak hour to obtain the peak hour flow and design speed of a selected road section.

COURSE OUTCOMES

- CO-1: Identify engineering properties of aggregate by performing laboratory tests necessary for highway construction.
- CO-2: Demonstrate engineering properties of soil by performing laboratory tests necessary for highway design and construction
- CO-3: Determine the grade & properties of bitumen by performing laboratory tests necessary for highway construction
- CO-4: Design Bitumen Mixes
- CO-5: Analyze the pavement material test results and suitability for construction purpose.
- CO-6: Create smart materials which can be used for cost effective construction of road.

TEXT-BOOK AND REFERENCE BOOKS:

1. L.R. Kadiyali, **Principles and Practices of Highway Engineering**, Khanna Publishers, 2009
2. MoRTH (2013) **Specification for Road and bridge works** (5th revision)
3. S. K. Khanna, C. E. G. Justo, A Veeraragavan, **Highway Engineering**, Khanna Publishers.
4. IRC: 37-2018 **Guidelines for Design of flexible Pavements**, IRC.
5. IRC: 58 - 2015: **Guidelines for the Design of Plain Jointed Rigid Pavements for Highways**, IRC.

					Estimation Costing and Valuation					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

1. To learn the concepts of Rate-Analysis.
2. To learn the concepts of Specification and its important.
3. To learn the fundamentals of Estimation.
4. To learn the concepts of Costing and its Description Writing.

UNIT I: RATE ANALYSIS

16 Hrs.

Introduction, Importance of Rate Analysis, Calculation of Rate Analysis, Schedules of Rate, Task Work, Rate Analysis of Different Items – Excavation, Brick Masonry, Stone Masonry, Cement Concrete (C.C) Work, R.C.C. Work, Plastering Work, Flooring Work, White Washing and Colouring Work, Roofing Work, Other Miscellaneous Items.

UNIT II: SPECIFICATION

12 Hrs.

Introduction, Objectives of Specification, Importance of Specification, Types of Specification, Principles of Writing Specification, Standard Specification Writing for Construction Items – Earthwork for Foundation, Cement Concrete, R.C.C Work, Brick Work in Cement Mortar (Class I, II and III), Different Types of Flooring, Different Types of Stone Masonry, Colouring Items, Roofing and Terrace Items (A.C. Sheet, G.I. Sheets), Canal Earthwork, etc.

UNIT III: ESTIMATION OF BUILDING AND OTHER WORK

16 Hrs.

Introduction, Types of Estimate, Methods of Estimation, General Estimation and Costing of Residential Building (Single Story and Double Story), Estimation of Septic Tank, Culverts, R.C.C Structures (Slab, Beam, Column-Footing, Retaining Wall), Road Work (Quantity of Cutting and Filling).

UNIT IV: VALUATION CONTRACT AND ARBITRATIONS

12 Hrs.

Definitions of various terms- method of valuation- Freehold & Leasehold properties- Sinking fund- depreciation and method of estimating depreciation- Outgoings, types of contract and arbitrations.

TOTAL HOURS: 56 Hrs.

COURSE OUTCOMES

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

- CO-1: Remember the Fundamentals Concepts of Estimation.
- CO-2: Demonstrate the Aspects of Rate Analysis, Specification and Estimation.
- CO-3: Utilise the Concepts to Identify the Rates of Different Construction Items.
- CO-4: Analyse the Different Construction Items and Write Its Specification.
- CO-5: Evaluate the Building and Its Components Using Concepts of Estimation.
- CO-6: Evaluate and Estimate Different Construction.

TEXT-BOOK AND REFERENCE BOOKS:

1. B. N. Dutta, “**Estimating and Costing in Civil Engineering**”, 28th Revised Edition, New Delhi: CBS Publishers & Distributors Pvt. Ltd.
2. M. Chakraborty, “**Estimating, Costing, Specification & Valuation in Civil Engineering**,” Kolkata.
3. D. D. Kohli, and R. C. Kohli, “**A Text Book of Estimating and Costing (Civil)**”, S Chand Publishers.
4. S.C. Rangwala, “**Estimating, Costing and Valuation, 15th Edition**”, Charotar Publishing House Pvt. Ltd.
5. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., “**Construction Planning, Equipment and Methods**”, 6th Edition, Tata McGraw-Hill, New Delhi, 2003
6. C.P.W.D. Hand Books
7. IS: 1200 (Part 1 to 28), “**Methods of Measurement of Building and Civil Engineering Works**”, Bureau of Indian Standards
8. SOR of respective Financial Year as approved by Authority

					Project Management					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	2	4	5	25	50	25	--	--	100

COURSE OBJECTIVES

- To develop ability and knowledge about the philosophy, concepts and scope of project management and the phases of project life cycle.
- To develop ability and knowledge about the different forms of project organization structures and work breakdown structures.
- To create problem solving ability and develop knowledge about the project planning & scheduling tools and also about the basic project controlling methods
- To develop ability and knowledge about the methods for project monitoring and methodology for project risk management.

UNIT 1: CONCEPT, SCOPE OF PROJECT MANAGEMENT AND PHASES OF PROJECT LIFE CYCLE

12 Hrs.

Introduction- Parameters affecting a project- Project planning & implementation cycle- Concept & scope of project management-Role of project manager- Enhancing the probability of success of a project Phases of project life cycle: Idea, Feasibility - Development, Implementation and Operation. Work Break Down structure (WBS)- Role of project manager in developing WBS- Typical hierarchy in the WBS of a project- Product oriented WBS; Functionally oriented WBS.

UNIT 2: PROJECT PLANNING AND SCHEDULING

12 Hrs.

Project organization structures - Factors responsible for organizational revolution- Formal & informal organization structures- Requirements of a project organization- Matrix organization structure- Selecting a project organization structure- Criteria to help determine a suitable organizational form in a given project environment Project Planning & Scheduling: Scheduling principles- Bar charts (Gantt charts)- Milestones Charts- S-curve- Network logic diagram- Critical path method- Arrow diagram- Time Estimates- Slack- Total float- Free float - Independent floats- Case studies.

UNIT 3: PROBABILISTIC TOOLS FOR PROJECT SCHEDULING AND PROJECT CONTROL

16 Hrs.

Probabilistic tools for Project Scheduling - PERT (Project Evaluation & Review Techniques) - Three time estimates (optimistic, most likely, pessimistic)- Beta distribution- Expected time- Variance in project duration- Case Studies Project Control: Concept- Control cycle- Basic controlling parameters- Line of Balance- Role of project management on control cycle- Time control-Cost control-Potentiality of cost reduction during different phases of a project- Cost planning- Control curves- Cash flow- Network Crashing, Time cost trade-off planning for minimum costs- Cost slope concept- Crash point- Normal Point- Total project cost- Controlling cost overrun & time overrun.

UNIT 4: PROJECT MONITORING AND RISK MANAGEMENT

16 Hrs.

Project Monitoring: Measurement of performance- Reporting of performance- Corrective measures for in favorable variations- Major functions of monitoring- Influence of decision-making authority in project monitoring Project Risk Management: Risk identification- Risk analysis- Risk response planning and mitigation measures- Case studies Sustainable development: Project management for sustainable development

Max. 56 Hrs

COURSE OUTCOMES

CO-1: Demonstrate the concepts and philosophy of project management and also about the different phases of the project life cycle.

CO-2: Design the methodology for formulation and application of work breakdown structure and organization structure.

CO-3: Demonstrate project planning and scheduling tools and techniques and complex critical path network diagrams.

CO-4: Analyze the problems pertaining to project evaluation and review technique.

CO-5: Apply the project monitoring methods and tools like Earned Value Analysis.

CO-6: Develop concepts about project controlling methods, project risk management and project management for sustainable development.

TEXT-BOOK AND REFERENCE BOOKS:

1. Kumar Neeraj Jha, "Construction Project Management", Pearson Publishers, New Delhi, 2018.
2. Nicholas John M, "Project Management for Business and Technology: Principles and Practice", 2nd Edition, Pearson Prentice Hall New Delhi, 2007.
3. Iyer P Parameshwar, "Engineering Project Management with case studies". Wheeler Publishing New Delhi, 2001.
4. Joy PK, "Handbook of Construction Management", Macmillan Delhi, 1990

					Project Management Laboratory					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	2	4	5	25	50	25	--	--	100

COURSE OBJECTIVES

1. Evaluate project management software like Microsoft Project, Primavera P6, etc., and learn their features.
2. Develop work breakdown structures (WBS) in Microsoft Project, assign resources, and use scheduling techniques.
3. Track project progress, analyze performance using EVM, and generate reports in Microsoft Project.
4. Explore best practices in using Microsoft Project for construction management, including visualization, managing multiple projects, and reporting, and learn about the Monte Carlo process for risk analysis.

UNIT 1: INTRODUCTION TO PROJECT MANAGEMENT TOOLS

4 Hrs.

Introduction- Overview of project management software, including Microsoft Project, Primavera P6 etc; Comparison of different project management software options; Introduction to Microsoft Project interface and features; Creating a new project; Setting up project properties and options; Adding tasks, task durations, and dependencies; Creating a project timeline using Gantt charts.

UNIT 2: PROJECT PLANNING AND SCHEDULING

8 Hrs.

Developing a work breakdown structure (WBS) in Microsoft Project; Assigning resources to tasks; Understanding resource calendars and resource leveling; Setting task constraints and deadlines; Fine-tuning project schedules using task types and effort-driven scheduling; Analyzing project schedules using the critical path method (CPM) and resource histograms.

UNIT 3: PROJECT TRACKING AND MONITORING

8 Hrs.

Updating project progress and tracking task completion; Managing changes to project scope, schedule, and resources; Analyzing project performance using earned value management (EVM); Generating project reports and dashboards; Communicating project status to stakeholders using Microsoft Project.

UNIT 4: ADVANCED TOPICS IN CONSTRUCTION MANAGEMENT

8 Hrs.

Best practices for using Microsoft Project in construction project management; Visualization techniques in Microsoft Project for better project understanding; Managing multiple projects with Microsoft Project Server or Project Online; Reporting capabilities of Microsoft Project for effective communication and decision-making. Introduction to Monte Carlo process for project risk analysis.

Sustainable development: Project management for sustainable development

Max. 28 Hrs

COURSE OUTCOMES

- CO-1: Evaluate and select appropriate project management software for specific project requirements.
CO-2: Create comprehensive project plans using work breakdown structures and interpret gantt charts.
CO-3: Assign Material, Manpower and Machinery Resources and Apply Levelling Techniques.
CO-4: Use Earned Value Management techniques to monitor project progress, analyze variances.
CO-5: Apply construction project management best practices, including visualization and managing multiple projects.
CO-6: Utilize Microsoft Project for effective project communication, decision-making, and risk analysis.

TEXT/REFERENCE BOOKS

1. "Microsoft Project 2019 Step by Step" by Cindy Lewis and Carl Chatfield.
2. "A Guide to the Project Management Body of Knowledge (PMBOK® Guide)–Sixth Edition" by Project Management Institute.
3. "Construction Project Management: A Complete Introduction" by Alison Dykstra.
4. "Project Management for Engineering, Business and Technology" by John M. Nicholas and Herman Steyn.

					Earthquake Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs./Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

1. To understand the fundamentals of earthquake and seismological aspects
2. To understand free and forced vibration and their analysis
3. To explain the principles of earthquake-resistant structures
4. To discuss code provisions and their application to different types of structures

UNIT I: SEISMOLOGY AND EARTHQUAKE FUNDAMENTALS

12 Hrs.

Seismology and earthquakes: Basic earthquake principles: Introduction - Internal structure of earth - Plate tectonics faults - seismic waves – Seismograph - Classification of earthquakes - Magnitude and intensity of earthquakes - Seismic zones in India - Earthquake ground motion: Amplitude parameters - frequency content parameters - duration parameters, Common Earthquake effects: Surface rupture - Regional subsidence – liquefaction – slope movement – Tsunami

UNIT II: THEORY OF VIBRATION AND MACHINE FOUNDATION

16 Hrs.

Free Vibrations of Single-Degree-of-Freedom Systems: Dynamic loads and dynamic analysis - degrees of freedom - Undamped free vibrations - multiple elastic forces - viscously damped vibrations, equations of motion and solution - logarithmic decrement. Forced vibrations of single-degree-of-freedom systems: Forced vibrations (harmonic loading) of single-degree-of-freedom systems - Undamped and viscously damped vibrations - equations of motion and solution - Force transmitted to the foundation – transmissibility - response to harmonic support excitations. Introduction, Types of Machines and Foundations, General requirements, Permissible Amplitude – Design

UNIT III: EARTHQUAKE-RESISTANT FEATURES OF STRUCTURE

12 Hrs.

Load Transfer Path - Strength Hierarchy - Reversal of Stresses - Importance of Beam-Column Joints - Importance of Stiffness and Ductility (Capacity Design Concept) in Structures - Earthquake Design Philosophy Inertia Forces - Behaviour of Brick Masonry - Stone Masonry and RC structures - Base Isolation - Adoptive Systems - Case Studies. Effect of Short Column - Soft Storey - Improper Detailing - Masonry Infill Walls – Eccentricity – Pounding - Floating Columns on Seismic Performance of Building

UNIT IV: LATERAL LOADS ON BUILDINGS AND DUCTILE DETAILING

16 Hrs.

Analysis for Earthquake Loads: IS: 1893-2016 - Seismic Coefficient method- modal analysis - Applications to multi-storied building frames. Ductile Detailing: Ductility of R.C. structures- Confinement- detailing as per IS-13920-2016 – principles of design of beams, and columns.

TOTAL HOURS: 56 Hrs.

COURSE OUTCOMES

- CO-1: Explain the fundamentals of seismology and earthquake effects
- CO-2: Analyse free and forced vibration with applications
- CO-3: Design machine foundations
- CO-4: Demonstrate the basic principle of earthquake-resistant design
- CO-5: Explain the ductile detailing concept and its associated effect on seismic structural response
- CO-6: Design the structures subjected to the earthquake by relevant Indian standards.

TEXT-BOOK AND REFERENCE BOOKS:

1. A.K. Chopra, “Dynamics of structures”, Prentice Hall.
2. I.S. 1893 - 2016, “Criteria for Earthquake Resistance Design of Structures”. BIS
3. Kramer, S. L., “Geotechnical Earthquake Engineering”, Pearson Education.
4. Day, R. W., “Geotechnical Earthquake Engineering Handbook”, McGraw Hill.
5. Kamlesh Kumar, “Basic Geotechnical Earthquake Engineering”, New Age.

					Major Project					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
			12	--	--	--	--	25	25	50

COURSE OBJECTIVES

1. To demonstrate expertise in the chosen project topic, showcasing robust technical knowledge.
2. To apply engineering principles to address real-world challenges faced by industry and society.
3. To develop proficiency in solving intricate problems using a systematic approach.
4. To communicate effectively, both in written and oral formats, with industry stakeholders and the broader community.

Details:

Students enrolled in the Civil Engineering program are required to select a research topic within the realm of current practices in the field. Collaborative project work is encouraged, with group sizes limited to a maximum of three students. Research areas encompass a wide spectrum including Structural Design and Analysis, Soil and Geotechnical Engineering, Traffic Engineering, Pavement Design and Analysis, Metro and Monorail Construction, Airport Planning and Design, Water Resource Management with GIS and Surveying, Construction Techniques and Management, as well as Environmental Engineering and Energy Conservation.

Each group must select a faculty member from the department to serve as their guide. The chosen research topic should align with the interests and expertise of both the group and the guide. Additionally, students undertaking major projects are required to include a one-page section outlining the novelty of their work.

Upon completion, the thesis must be formatted according to PDPU standards and submitted to the department through the designated guide. One copy, signed by both the guide and the Head of the Department, will be archived in the departmental library for record-keeping and to verify originality. A review committee consisting of at least two faculty members will assess the internal components of the project and dissertation work, while the external review panel will include an external examiner, the department head, and the guide.

COURSE OUTCOMES

- CO-1: Define the relevance of the project topic utilizing established techniques in Civil Engineering.
- CO-2: Summarize the problem statement with analytical and documentation skills, informed by literature surveys.
- CO-3: Apply gathered data to formulate project plans.
- CO-4: Solve problems using contemporary tools and techniques, supported by critical investigation.
- CO-5: Prepare a comprehensive project report adhering to institutional guidelines.
- CO-6: Present project findings effectively using accepted tools like PowerPoint.

					Comprehensive Project					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
			12	--	--	--	--	25	25	50

COURSE OBJECTIVES

1. To understand civil engineers' roles on construction sites.
2. To grasp contract processes and governmental policies.
3. To master structural design and analysis for diverse projects.
4. To develop skills in scheduling and work execution management.

Details:

Students and the university are tasked with selecting a company specializing in Civil Engineering for an individual comprehensive project. The project scope encompasses various areas such as Structural Design and Analysis, Soil and Geotechnical Engineering, Traffic Engineering, Pavement Design and Analysis, Metro and Monorail Construction, Airport Planning and Design, Water Resource Management with GIS and Surveying, Construction Techniques and Management, as well as Environmental Engineering and Energy Conservation.

Each student must choose a mentor from the department and a supervisor from the industry. The selected project area should be mutually agreeable to both the student and the mentor.

Upon completion, the project report must be formatted according to PDPU standards and submitted to the department through the industry supervisor and departmental mentor, accompanied by an industry training certificate. One copy of the thesis, endorsed by the mentor and the Head of the Department, will be archived in the departmental library to ensure originality and record-keeping.

A review committee comprising a minimum of two faculty members will evaluate the internal components of the comprehensive project work, while the external review panel will consist of an external examiner, the department head, and the mentor.

COURSE OUTCOMES

CO-1: Define the relevance of comprehensive project work area selected for the study.

CO-2: Understand the role and responsibility of a civil engineering at construction site.

CO-3: Analyse the various civil engineering components as per site requirement.

CO-4: Apply the knowledge in execution of work in a systematic manner

CO-5: Prepare schedule of workers, material and equipment requirement for day to day work execution.

CO-6: Practice the acquired knowledge, skills and attitudes for becoming a professional engineer