ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

CIVIL ENGINEERING

For

B.TECH + M.TECH INTEGRATED DUAL DEGREE PROGRAMME
(Applicable for the batches admitted from 2021-2022)

JNTUH UNIVERSITY COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY HYDERABAD
Kukatpally, Hyderabad – 500085
Telangana, India

Vision of the Institution

To be recognized as one of the top 10 institutes in the country offering technical education, sustaining and improving its **repute of UG programmes**, expanding **need based PG and research programmes** with global outlook, synergizing teaching and research for societal relevance.

Mission of the Institution

1. To identify technological advancements and build the **right level of skills at the right Time** contributing to the industrial and national growth.
2. To identify and keep abreast with the **state of the art technology maintaining** its legacy of Striving for excellence in higher education.
3. To promote **world class research** of local relevance to society.
4. With a research community of professors, research fellows and research centres, **expand the Scale and multidisciplinary** character of its research activities.
5. With a **global outlook** strive for collaborations to network with International Universities And National Institutes of Research and Higher Learning.

Vision of the Department

- The Department of Civil Engineering is committed to raise the intellectual tone of the young students in understanding and incorporating emerging technologies, with an objective of enhancing their competence by applying their proficiency and skill for infrastructure andeconomic development of the society.

- **Mission of the Department:**
  1. To strengthen the teaching tools in order to orient students to acquire necessary skills to perform in the field or to handle industrial projects.
  2. To enhance students into knowledgeable, responsible professionals, successful practitioners and lifelong learners in emerging fields for the betterment of society.
  3. To improve the quality of technological education through training, consultancy, research, and innovation.
  4. To identify, evaluate and implement scientifically proven technological solutions.

Program Educational Objectives

PEO 1	To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and to pursue and to enroll in advanced studies
PEO 2	To Impart basic technical knowledge and skills in Civil Engineering and related fields to cater to the emerging technological needs of society.
PEO 3	To perceive the technical knowhow, adaptability and innovation in their work so as to pursue lifelong learning, and to be leaders, both in their chosen profession and in other activities.
PEO 4	To Provide expertise in carrying out civil engineering projects by using state-of-art of computing and experimental techniques to develop interdisciplinary approach.
PEO 5	To Train the student to possess good communication and presentation skills with ability to work in teams and contributing significantly to the technological development of the Nation.

Program Outcomes

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

Program Specific Out Comes

1. Understand the basics of Science, behavioral mechanics and engineering materials required for Engineering systems.
2. Survey, explore, analyze, formulate, design and manage complete Civil Engineering systems by incorporating socio-cultural and environmental needs
3. Develop social skills required for multidisciplinary and collaborative works
4. Train professionally to understand the ongoing field problems and their solutions**.**

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DEPARTMENT OF CIVIL ENGINEERING

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COURSE STRUCTURE & DETAILED SYLLABUS (W.E.F.2021-22)

I YEAR **I SEMESTER**

S. No.	Course Code	Subject Code	Course Title	L	T	P	Credits
1.	BSC	A1101	Applied Algebra and Calculus	3	1	0	4
2.	BSC	A1103	Engineering Physics	3	1	0	4
3.	ESC	A1102	Programming for Problem Solving	3	0	0	3
4.	ESC	A1105	Engineering Graphics	1	0	3	2.5
5.	BSC -LC	A11L2	Engineering Physics Laboratory	0	0	3	1.5
6.	ESC -LC	A11L1	Programming for Problem Solving Laboratory	0	0	3	1.5
7.	MC	A11M1	Induction Programme	0	0	0	0
			Total Credits				16.5

I YEAR **II SEMESTER**

S. No.	Course Code	Subject Code	Course Title	L	T	P	Credits
1.	BSC	A1201	Applied and Multivariable Calculus (Advanced Calculus)	3	1	0	4
2.	BSC	A1206	Engineering Chemistry	3	1	0	4
3.	ESC	A1208	Engineering Mechanics	3	1	0	4
4.	HSMC	A1204	English	2	0	0	2
5.	BSC -LC	A12L1	Engineering Chemistry Laboratory	0	0	2	1
6.	ESC- LC	A12L3	Engineering Work Shop	0	0	3	1.5
7.	HSMC	A12L4	English Language and Communication Skills Laboratory	0	0	2	1
8.	ESC-LC	A12L5	Applied Python programming Laboratory	0	1	2	2
			Total Credits				19.5

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COURSE STRUCTURE & DETAILED SYLLABUS (W.E.F.2021-22)

II YEAR **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	BSC	Probability and Statistics	3	1	0	4
2.	PCC-1	Building Materials, Construction and Planning	3	0	0	3
3.	PCC-2	Engineering Geology	2	0	0	2
4.	PCC-3	Strength of Materials-I	3	1	0	4
5.	PCC-4	Fluid Mechanics	3	1	0	4
6.	ESC-LC	Computer aided Civil Engineering Drawing	0	0	3	1.5
7.	LC-1	Strength of Materials Laboratory	0	0	3	1.5
8.	LC-2	Engineering Geology Laboratory	0	0	2	1
9.	*MC	Environmental Science	2	0	0	0
Total Credits						**21**

II YEAR **II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1.	ESC	Basics of Electrical & Electronics Engineering	3	0	0	3
2.	ESC	Basics of Mechanical Engineering	2	0	0	2
3.	PCC-5	Surveying	3	0	0	3
4.	PCC-6	Strength of Materials-II	3	0	0	3
5.	PCC-7	Hydraulics and Hydraulic Machinery	3	0	0	3
6.	PCC-8	Structural Analysis –I	3	0	0	3
7.	LC-3	Surveying Laboratory	0	1	2	2
8.	ESC-LC	Basic Electrical & Electronics Laboratory	0	0	2	1
9.	LC-4	Fluid Mechanics & Hydraulic Machinery Laboratory	0	0	2	1
10.	*MC	Indian Constitution	2	0	0	0
Total Credits						**21**

Note:* MC- Mandatory Course (Non credit course)

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III YEAR **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PCC-9	Structural Analysis-II	3	0	0	3
2.	PCC-10	Geotechnical Engineering	3	0	0	3
3.	PCC-11	Structural Engineering –I(RCC)	3	1	0	4
4.	PCC-12	Transportation Engineering	3	0	0	3
5.	PEC-1	Professional Elective-I	3	0	0	3
6.	HSMC	Economics And Financial Analysis	3	0	0	3
7.	LC-5	Concrete Technology and Highway Engineering Laboratory	0	0	2	1
8.	LC-6	Geotechnical Engineering Laboratory	0	0	2	1
9.	HSMC-LC	Advanced Communications skills Laboratory	0	0	2	1
10.	*MC	Introduction to Artificial Intelligence	2	0	0	0
	Total Credits					**22**

III YEAR **II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1.	PCC-13	Environmental Engineering	3	0	0	3
2.	PCC-14	Foundation Engineering	3	0	0	3
3.	PCC-15	Structural Engineering –II(Steel)	3	1	0	4
4.	PCC-16	Hydrology & Water Resources Engineering	3	1	0	4
5.	PEC-2	Professional Elective - II	3	0	0	3
6.	OEC-I	Open Elective –I	3	0	0	3
7.	LC-7	Environmental Engineering Laboratory	0	0	2	1
8.	LC-8	Computer Aided Design Laboratory	0	0	2	1
9.	*MC	Introduction to Cyber security	2	0	0	0
	Total Credits					**22**

Note: * MC- Mandatory Course (Non credit course)

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IV YEAR **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PROJ(UG)	Project Stage -I	0	0	6	3
2.	MINI(UG)	Mini Project / Summer Internship	0	0	4*	2
3.	PCC(UG)	Estimation, Costing and Project Management	3	0	0	3
4.	PEC(UG)-III	Professional Elective -III	3	0	0	3
5.	PEC(UG)-IV	Professional Elective -IV	3	0	0	3
6.	PEC(UG)-V	Professional Elective-V	3	0	0	3
7.	OEC(UG)	Open Elective-II	3	0	0	3
8.	PC(PG)-1	Theory of Elasticity	3	0	0	3
9	LC-CE-9	Structural Design Laboratory	0	0	2	1
10.	PG(LAB)-1	Numerical Analysis Laboratory	0	0	4	2
		Total Credits				**26(21UG+5 PG)**

*refers that the student will complete the credits in preceding summer

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IV YEAR **II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	PROJ(UG)	Project Stage -II	0	0	16	8
2	PC(PG)-2	Advanced Structural Analysis	3	0	0	3
3	PC(PG)-3	Structural Dynamics	3	0	0	3
4	PE(PG)-1	1. Theory of Thin Plates & Shells 2. Design of Pre-stressed Concrete Structures 3.Theory of Structural Stability	3	0	0	3
5	PE(PG)-2	1.Advanced Reinforced Concrete Design 2.Structural Health Monitoring 3.Design of Bridges	3	0	0	3
6	PE(PG)-3	1.Advanced Steel Design 2.Design of Formwork 3. Design of High Rise Buildings	3	0	0	3
7	PG(LAB)-2	Advanced Structural Concrete Laboratory	0	0	4	2
8	MC	Research Methodology and IPR	2	0	0	2
		Total Credits	**17**	**0**	**20**	**27 (8UG+19PG)**

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COURSE STRUCTURE & DETAILED SYLLABUS (W.E.F.2021-22)

V YEAR **I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	PC(PG)-4	FEM in Structural Engineering	3	0	0	3
2	PE(PG)-4	1.Earthquake Resistant Design of Buildings 2. Pre – Engineered Buildings 3. Rehabilitation and Retrofitting of Structures	3	0	0	3
3	OEC(PG)	Open Elective	3	0	0	3
4	PG	Dissertation Phase-I	0	0	20	10
5	PG(LAB)-3	Advanced Structural Design Laboratory	0	0	4	2
		Total Credits				**21**

V YEAR **II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	PG	Dissertation Phase-II	0	0	32	16
		Total Credits				**16**

Total UG Credits: 151
Total PG Credits: 61

Professional Elective –I

1. Concrete Technology
2. Building Information Modelling
3. Introduction To Offshore Structures

Professional Elective –II

1. Prestressed Concrete
2. Optimization techniques in structural engineering
3. Introduction to Composite Materials

Professional Elective -III

1. Irrigation and Hydraulic Structures
2. Finite Element Methods
3. Pavement Management Systems

Professional Elective-IV

1. Photogrammetry and UAV
2. Urban Transportation Planning
3. Advanced Structural Design

Professional Elective –V

1. Solid Waste Management
2. Environmental Impact Assessment
3. Air pollution

Open Elective -I

Disaster Mitigation and Management

Open Elective -II

Remote Sensing & GIS

Open Elective - PG

Green Building Technologies

APPLIED ALGEBRA AND CALCULUS

I Year I- Sem

L	T	P	C
3	1	0	4

Pre-requisites: Mathematical Knowledge of 12th /intermediate level

Course Objectives: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and Eigenvectors and to reduce the quadratic form to canonical form
- Methods of solving the differential equations of first and higher order.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.

UNIT-I: Matrices

Matrices: Rank of a matrix: Echelon form, Normal form. System of linear equations: solving system of Homogeneous and Non-Homogeneous equations, Gauss-elimination method, LU Decomposition method.

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties, Eigen values and Eigenvectors of Symmetric, Hermitian, Skew-Symmetric, Skew-Hermitian, Orthogonal and Unitary matrices.

UNIT-II: Diagonalization of a Matrix

Diagonalization of a matrix. Cayley - Hamilton Theorem (without proof), Finding inverse and power of a matrix by Cayley - Hamilton Theorem. Quadratic forms and Nature of the Quadratic Forms: Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT-III: Mean value theorems and Beta, Gamma functions

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. (All Theorems without proof).

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-IV: First Order ODE

Exact differential equations, converting non-exact equations to exact equations, Linear and Bernoulli's differential equations. Applications: Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories and electrical circuits. First order equations with higher degree: solvable for the differential coefficient, dependent variable and Independent variable.

UNIT-V: Ordinary Linear Differential Equations of Higher Order

Second order linear differential equations with constant coefficients - Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax,$ polynomials in x, $e^{ax}V(x)$ and $xV(x)$ - method of variation of parameters, Equations reducible to linear ODE with constant coefficients, Legendre's equation, Cauchy-Euler equation. Applications: Bending of beams, Electrical circuits and simple harmonic motion.

Course Outcomes:

After learning the contents of this course , the student will be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations.
- Find the Eigen values and Eigen vectors.
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Identify whether the given differential equation of first order is exact or not.
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions.
- Evaluation of improper integrals using Beta and Gamma functions.

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

References

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010

ENGINEERING PHYSICS

I Year I-Sem **L T P C**
3 1 0 4

Course Objectives:

The course should enable the students to:

- Understand the concepts of interference and diffraction.
- Learn the basic principles of laser and optical fibre.
- Know about the classification of materials into three groups.
- Exposed to present generation engineered materials and their properties.
- Have knowledge about principles of wave mechanics.

UNIT-I: Wave Optics

Huygen's principle, Superposition of waves and interference of light by wave front splitting and amplitude splitting, Young's double slit experiment, Newton's rings, Michelson's interferometer, Mach-Zehnder interferometer, Fraunhofer diffraction from a single slit and circular aperture, Diffraction grating: Grating spectrum and resolving power.

UNIT-II: Lasers and Fibre Optics

Lasers: Interaction of radiation with matter: Spontaneous and Stimulated emission and absorption, Einstein coefficients, Characteristics of lasers: Resonating cavity, Active medium, pumping, population inversion, Construction and working of laser: Ruby laser, He-Ne laser, applications of lasers.

Fibre Optics: Introduction, Principle and Construction of an optical fibre, Acceptance angle, Numerical aperture, Types of Fibres, losses associated with optical fibres, Basic components in optical fibre communication system, Applications of optical fibres.

UNIT-III: Introduction to solids

Free electron theory of metals, Classical and quantum free electron theory, Estimation of Fermi energy, Dependence of Fermi level on temperature, Density of states, Bloch's theorem, Kronig – Penny modal and origin of energy bands, Classification of materials on the basis of energy bands, E – K diagram, Direct and Indirect band gaps, Effective mass.

UNIT-IV: Engineered semiconductor materials

Nano materials: Introduction, quantum confinement, surface to volume ratio, density of states in 2D, 1D and 0D (qualitatively), Practical examples of low-dimensional systems such as quantum wells, wires and dots: design, fabrication and characterization techniques, Heterojunctions and associated band-diagrams.

UNIT-V: Introduction to Mechanics

Introduction, Space and Time, Newton's laws of motion, Inertial frames, Gravitational mass, Mechanics of a particle: Conservation of linear momentum, Conservation of angular momentum, Conservation of energy.

Mechanics of a system of particles: External and Internal forces, Centre of mass, Conservation linear momentum, Conservation of angular momentum and conservation of energy.

Course Outcomes:

The student will able to:

- Analyze and get knowledge about interferometers and grating.
- Justify applications and principles of laser and how the graded index optical fiber is more. efficient than step index optical fiber in fiber optic communication system.
- Gain clear knowledge about Fermi level and energy band diagram.
- Get clear knowledge about fabrication and characterization of nanomaterials and also will have knowledge about quantum wells and quantum dots.
- Learn about completeness of Newton's laws and their applications.

Text Books:

1. A Textbook of Engineering Physics, Dr. M.N. Avadhanulu, Dr. P.G Kshirsagar – S.Chand
2. Haliday and Resnick, Physics – Wiley,2007.

References:

1. Classical Mechanics by J.C. Upadyaya, Himalaya Publishing House, 2005.
2. Introduction to Solid State Physics by Charles Kittel, Wiley Student Edition
3. O. Svelto, "Principles of Lasers".
4. Ajoy Ghatak, "Optics", Mc Graw-Hill Education, 2020

PROGRAMMING FOR PROBLEM SOLVING

I Yr – I Sem

L	T	P	C
3	0	0	3

Prerequisites: Nil

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in Program development.
- To learn the syntax and semantics of C Programming Language.
- To learn the usage of structured programming approach in solving problems.

UNIT – I:

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

Introduction to C Language: Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

UNIT – II:

Statements: if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

Designing Structured Programs: Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

UNIT – III:

Arrays and Strings: Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT – IV:

Pointers: Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

Input and Output: Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

UNIT – V:

Derived types: Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures,

self-referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

Sorting and Searching: Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods.

Course Outcomes:

The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To translate the algorithms/flowcharts to programs (in C language).
- To code and test, a given logic in C programming language.
- To formulate simple algorithms for arithmetic and logical problems.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to formulate algorithms and programs. Searching and sorting problems.

Text Books:

1. C Programming & Data Structures by B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning,2019.
2. Problem Solving and Program Design in Cby J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education , 2020.
3. The C Programming Language by B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education,2021.

Reference Books:

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A. M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press

ENGINEERING GRAPHICS

I Yr – I Sem **L T P C**
1 0 3 2.5

Pre-requisites: Nil

Course Objectives:

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

UNIT–I:

Introduction To Engineering Drawing:

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Involute. Scales – Plain, Diagonal and Vernier Scales.

UNIT-II:

Orthographic Projections:

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. —Auxiliary Planes.

UNIT–III:

Projections of Regular Solids – Auxiliary Views.

UNIT–IV:

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

UNIT–V:

Isometric Projections:

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions Auto CAD: Basic principles only.

Course Outcomes:

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

- Prepare working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

Text Books:

1. Engineering Drawing by N.D. Bhatt, Charotar,2011.
2. Engineering Drawing and Graphics by Rane and Shah, Pearson Edu,2009.

References:

1. A Text Book of Engineering Drawing by Dhawan R K, S. Chand
2. Engineering Graphics with Auto CAD by James D Bethune, Pearson Edu.
3. Engineering Graphics by K R Mohan, Dhanpat Rai.
4. Text book on Engineering Drawingby KL Narayana, P Kannaih, Scitech

ENGINEERING PHYSICS LABORATORY

I Yr –I Sem **L T P C**

0 0 3 1.5

Course Objectives:

- To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.
- To introduce the concepts and techniques which have a wide application in experimental science, but have not been introduced in the standard courses.
- To teach how to write a technical report which communicates scientific information in a clear and concise manner.

List of Experiments

1. Melde's experiment: To determine the frequency of a vibrating bar or turning fork using Melde's arrangement.
2. Torsional pendulum: To determine the rigidity modulus of the material of the given wire using torsional pendulum.
3. Newton's rings: To determine the radius of curvature of the lens by forming Newton's rings.
4. Diffraction grating: To determine the number of lines per inch of the grating.
5. Dispersive power: To determine the dispersive power of prism by using spectrometer.
6. Coupled Oscillator: To determine the spring constant by single coupled oscillator.
7. LCR Circuit: To determine quality factor and resonant frequency of LCR circuit.
8. Laser: To study the characteristics of LASER sources.
9. Optical fibre: To determine the bending losses of Optical fibres.
10. Optical fibre: To determine the Numerical aperture of a given fibre.
11. Sonometer: To determine the AC frequency.
12. Stewart – Gee's experiment: Determination of magnetic field along the axis of A current carrying coil.

Note: Any 8 experiments are to be performed by each student

Course Outcomes:

By the end of the course students will be able:

- To make careful experimental observations and draw conclusions from such data.
- To distinguish between inferences based on theory and the outcomes of experiments.
- To write a technical report which communicates scientific information in a clear and concise manner.

PROGRAMMING FOR PROBLEM SOLVING LABORATORY

I Yr - I sem **L T P C**

0 0 3 1.5

Course Objectives :

- To learn the fundamentals of computers.
- To understand the various steps in Program development.
- To learn the syntax and semantics of C Programming Language.
- To learn the usage of structured programming approach in solving problems.

Week 1:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.

Week 2:

5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 3:

9. Write a C program to find both the largest and smallest number in a list of integers. 10.Write a C program that uses functions to perform the following:
   i) Addition of Two Matrices
   ii) Multiplication of Two Matrices

Week 4:

11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.

Week 5:

15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+.....+x^n$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next

pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

Week 6:

18.2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:

20. Write a C program that uses functions to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers
    (Note: represent complex number using a structure.)

Week 8:

21. i) Write a C program which copies one file to another.
ii) Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line.)

22. i)Write a C program to display the contents of a file.
ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Week 9:

i) Write a C program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort

Week 10:

27. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
i) Linear search ii) Binary search

Course Outcomes : The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To translate the algorithms/flowcharts to programs (in C language).
- To code and test a given logic in C programming language.
- To formulate simple algorithms for arithmetic and logical problems.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to formulate algorithms and programs.
- Searching and sorting problems.

Text Books:

1. C Programming & Data Structures by B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning , 2010.
2. Problem Solving and Program Design in Cby J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education, 2013.
3. The C Programming Language by B.W. Kernighan and Dennis M.Ritchie, PHI, Pearson Education , 2020.

Reference Books:

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press.

APPLIED AND MULTI VARIABLE CALCULUS

I Yr – II Sem **L T P C**
3 1 0 4

Pre-requisites: Mathematical Knowledge of 12^{th} / Intermediate level

Course Objectives: To learn

- Concept, properties of Laplace transforms.
- Solving ordinary differential equations using Laplace transforms techniques.
- Partial differentiation, concept of total derivative.
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

UNIT-I: Laplace transforms:

Laplace Transforms; Laplace Transform of standard functions, first shifting theorem,Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions,Inverse Laplace transform by different methods, convolution theorem (without proof), solving Initial value problems by Laplace Transform method.

UNIT-II: Partial Derivatives and applications

Definitions of Limit and continuity. Partial Differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence, Maxima and minima of functions of two variables and three variables, method of Lagrange multipliers.

UNIT-III: Multiple Integration

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form). Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallel piped).

UNIT-IV: Vector Differentiation

Vector point functions and scalar point functions. Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

Course Outcomes:

After learning the contents of this paper the student must be able to

- Use the Laplace transforms techniques for solving ODE's.
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and gravity for cubes, sphere and rectangular parallel piped

- Evaluate the line, surface and volume integrals and converting them from one to another

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. M Apostol , Calculus vol-2, John Wiley & Sons,2018.

References

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
   S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984

ENGINEERING CHEMISTRY

I Yr – II Sem **L T P C**

3 1 0 4

Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To acquire the knowledge of water treatment, electrochemistry and corrosion which are essential for the Engineers and in industry.
- To acquire the skills pertaining to Polymers and Energy sources to apply them for various engineering fields etc.
- To impart then knowledge of Engineering materials and their aspects useful for understanding material chemistry.

Unit- I: Water And Its Treatment:

Introduction – hardness of water – Causes of hardness. Types of hardness: temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination, breakpoint chlorination, Ozonisation. Boiler troubles - Scale, Sludge, Priming, Foaming and Caustic embrittlement. Treatment of boiler feed water by Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water- Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems based on Determination of hardness of water.

Unit- II: Electrochemistry And Corrosion:

Introduction – hardness of water – Causes of hardness . Types of hardness: temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment. Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water. Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

Unit-III: Polymeric Materials:

Polymers: Definition, Monomer, functionality and degree of polymerisation. Classification – Types of Polymerisation - Addition & Condensation – Mechanisms of Polymerisation. Plastics: Definition, characteristics - Compounding and fabrication- Methods of Moulding - Thermoplastics and Thermosets – Preparation, properties and applications– PVC, Teflon and Bakelite. Fibres: Definition, Characteristics. Preparation, Properties and applications of Terylene, Nylon 6:6. Elastomers: Definition and characteristics. Natural rubber- structure, processing of latex, Vulcanisation. Preparation, properties and applications of BuNa-S and Butyl rubber. Conducting Polymers- Definition, Classification. Mechanism of conduction in Polyacetylene, Polyaniline & Applications. Biodegradable polymers - Concept, Synthetic and Natural polymers, Polylactic acid, Poly Vinyl alcohol, Nylon-2 and Nylon – 6. Applications and advantages of biodegradable polymers.

Unit-IV: Energy Sources:

Fuels: Definition, classification with examples. Calorific value. Determination of calorific value by Junker's gas Calorimeter. Characteristics of good fuel. Coal: Types- Analysis of coal- proximate analysis. Petroleum- Refining- Fractional distillation- composition, properties and uses

of petrol, diesel and kerosene. Cracking-types, Moving bed catalytic cracking. Knocking - Octane and Cetane rating, Composition, characteristics and uses of LPG, CNG. Biodiesel- Transesterification. Advantages. Hydrogen fuel- Production, storage, advantages and limitations. Combustion - Definition, Calculation of air required for the combustion of fuel, numerical problems related to calorific value and combustion

Unit-V: Engineering Materials:

Portland cement: Composition and constituents. Setting and hardening of cement, special cements- properties and uses of High alumina cement, White cement and water proof cement. RCC, Decay of Concrete. Refractories: Classification, Properties - Refractoriness, RUL, Chemical inertness and porosity. Characteristics of a good refractory. Engineering Applications. Failure of a refractory. Lubricants: functions of lubricants, Classification, Mechanism of Lubrication, Properties - Viscosity, Acid value, Flash & Fire point, Cloud & Pour point, Aniline point.

Course Outcomes: The basic concepts included in this course will help the student to gain:

- Differentiate hard and soft water; solve the related problems on water purification and its significance in industry and daily life.
- Understand the principles, concepts of electrochemistry and causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.
- The required skills to get clear concepts on polymers and energy sources and their applications to various engineering fields etc.
- The knowledge of engineering materials such as Portland cement, white cement, concrete and lubricants etc.

Text Books:

1. Engineering Chemistry – PC Jain and M Jain – Dhanpath Rai and Sons, New Delhi,2015.

Reference Books:

1. Text book of Engineering Chemistry by Ramadevi, Venkata Ramana Reddy & Prashanth Rath, Cengage learning publications.
2. A text book of Engineering Chemistry by Thirumala Chary, Laxminarayana, Shashikala. Pearson Publications.

ENGINEERING MECHANICS

I Year II-Sem

L	T	P	C
3	1	0	4

Pre-Requisites: **NIL**

Course Objectives:
During this course, students should develop the ability to:

- Work comfortably with basic engineering mechanics concepts required for analyzing static structures
- Identify an appropriate structural system to studying a given problem and isolate it from its environment.
- Model the problem using good free-body diagrams and accurate equilibrium equations
- Identify and model various types of loading and support conditions that act on structural systems.
- Apply pertinate mathematical, physical and engineering mechanical principles to the system to solve and analyze the problem.
- Understand the meaning of centers of gravity (mass)/centroids and moments of Inertia using integration methods.
- Communicate the solution to all problems in an organized and coherent manner and elucidate the meaning of the solution in the context of the problem.

UNIT – I:

Introduction Of Engineering Mechanics

Basic concepts System of Forces-Coplanar Forces–Components in Space–Resultant- Moment of Forces and its Application – Couples and Resultant of Force System-Equilibrium of System of Forces-Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributed and uniformly varying loading.

UNIT – II:

Friction

Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone of limiting friction– Friction of wedge, block and Ladder – Screw jack – Differential screw jack - Motion of Bodies**.**

UNIT – III:

Centroid And Center Of Gravity

Centrods – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies – Area moment of Inertia:–polar Moment of Inertia–Transfer–Theorems - Moments of Inertia of Composite Figures.

Moment Of Inertia: Moment of Inertia of Areas and Masses – Transfer Formula for Moments of Inertia- Moment of inertia of composite areas and masses.

UNIT – IV:

Kinematics

Introduction – Rectilinear motion – Motion with uniform and variable acceleration– Curvilinear motion–Components of motion– Circular motion – Projectiles- Instantaneous centre.

UNIT – V:

Kinetics

Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principle of conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

Course Outcomes:

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

- Solve problems dealing with forces in a plane or in space and equivalent force Systems.
- Solve beam and cable problems and understand distributed force systems.
- Solve friction problems and determine moments of Inertia and centroid using intergration methods.
- Understand and know how to solve three-dimension force and moment problems.
- Understand and know how to use vector terminology.

Textbooks:

1. Engineering Mechanics by Shames & Rao-PearsonEducation.
2. Engineering Mechanics by M.V. Seshagiri rao and Durgaih; UniversityPress, 2005.
3. Engineering Mechanics – B. Bhattacharya - Oxford University Publications,2021.

References:

1. Engineering Mechanics (Statics and Dynamics) byHibbler; Pearson Education.
2. Engineering Mechanics by Fedrinand L. Singer – Harper Collings Publishers.
3. EngineeringMechanicsbyA.K.Tayal,UmeshPublication.
4. EngineeringMechanics–G.S.Sawhney,PrinticeHallofIndia.
5. A textbook of engineering mechanics by R. K. Bansal; Laxmi publications.
6. EngineeringMechanicsbyR.S.Khurmi;S.Chand&Co.

ENGLISH

I Yr– II Sem **L T P C**
2 0 0 2

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt and for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development in the areas of Vocabulary, Grammar, Reading and Writing Skills, fostering ideas and practice of language skills in various contexts.

Course Objectives

The course will help students to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.

SYLLABUS

(Note: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open- ended, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the class.)

Unit –I

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes. Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions. Reading: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely – Paragraph writing – Types, Structures and Features of a Paragraph - Creating Coherence.

Unit –II

Vocabulary: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with Resume.

Unit –III

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives- Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Writing Introduction and Conclusion - Essay Writing.

Unit –IV

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading.

Writing: Writing Practices---Précis Writing.

Unit –V

Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: Listening and Speaking skills which are given under Unit-6 are covered in the syllabus of ELCS Lab Course.

Course Outcomes

Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

References:

i. Practical English Usage. Michael Swan. OUP. Fourth Edition 2016.

ii. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2018.

iii. English: Context and Culture by Board of Editors published by Orient BlackSwan Pvt. Ltd.

iv. Remedial English Grammar. F.T. Wood. Macmillan.2007.

v. On Writing Well. William Zinsser. Harper Resource Book. 2001

vi. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.

vii. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press

ENGINEERING CHEMISTRY LABORATORY

I Yr– II Sem **L T P C**
0 0 2 1

I. Volumetric Analysis:

1. Estimation of Ferrous iron by Dichrometry method.
2. Estimation of Ferrous iron by Permanganometry method.
3. Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry:

1. Estimation of the concentration of an acid by Conductometry.

III. Potentiometry:

1. Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. *p*H Metry:

1. Determination of an acid concentration using *p*H meter.

V. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon-6.

VI. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation Saponification value of a lubricant oil.
3. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Corrosion:

1. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

Recommended Books:

1. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications, 2015.
2. Laboratory Manual of Engineering Chemistry by Y. Bharathi Kumari & Jyotsna C, VGS Booklinks, Vijayawada, 2009.
3. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).
4. Engineering Chemistry Lab Manual by Cengage Publications.

ENGINEERING WORKSHOP

I Yr – II Sem **L T P C**
0 0 3 1.5

Pre-requisites: Practical skill

Course Objectives: The objectives of this course is

- To impart hands-on practice on Carpentry trade and skills.
- To impart hands-on practice on Fitting trade and skills.
- To impart hands-on practice on Black Smithy trade and skills.
- To impart hands-on practice on House Wiring trade and skills.
- To impart hands-on practice on Tin Smithy trade and skills.
- To impart hands-on practice on Plumbing trade and skills.

Note: At least two exercises to be done from each trade.

A. Carpentry
1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint

B. Fitting
1. Vee Fit
2. Square Fit
3. Half Round Fit

C. Black Smithy
1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring

D. House Wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting

E. Tin Smithy
1. Taper Tray
2. Open Scoop
3. Funnel

F. Plumbing
1. Coupling Joint
2. Elbow Joint
3. T Joint

Text Books:

1. Workshop Practice by B.L.Juneja Cengage Learning,2015.
2. Elements of Workshop Technology–S. K.Hajra Choudhury and A. K. Hajra Choudhury,2010.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I Yr– II Sem **L T P C**
0 0 2 1

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking and interviews

Syllabus

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

Listening Skills

Objectives

1. To enable students, develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right

- Intonation in sentences.
- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

- Oral practice: Just A Minute (JAM) Sessions
- Describing objects/situations/people

- Role play – Individual/Group activities

The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab**)**

Exercise – I:
CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.
ICS Lab:
Understand: Communication at Work Place- Spoken vs. Written language.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II:
CALL Lab:
Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context. Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.
ICS Lab:
Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise – III:
CALL Lab:
Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.
ICS Lab:
Understand: How to make Formal Presentations. Practice: Formal Presentations.

Exercise – IV:
CALL Lab:
Understand: Listening for General Details. Practice: Listening Comprehension Tests. **ICS Lab**:
Understand: Public Speaking – Exposure to Structured Talks. Practice: Making a Short Speech – Extempore.

Exercise – V:
CALL Lab:
Understand: Listening for Specific Details. Practice: Listening Comprehension Tests.

ICS Lab:
1. Introduction to Interview Skills.
2. Common errors in speaking.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

Course Outcomes

Students will be able to attain

- Better understanding of nuances of English language through audio- visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking skills with clarity and confidence which in turn enhances their employability skills

APPLIED PYTHON PROGRAMMING LABORATORY

I Yr– II Sem

L	T	P	C
0	1	2	2

Cycle - 1

1. **Downloading and Installing Python and Modules**
   a) **Python 3 on Linux**
   Follow the instructions given in the URL https://docs.python-guide.org/starting/install3/linux/
   b) **Python 3 on Windows**
   Follow the instructions given in the URL https://docs.python.org/3/using/windows.html
   (Please remember that Windows installation of Python is harder!)
   c) **pip3 on Windows and Linux**
   Install the Python package installer by following the instructions given in the URL
   https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/
   d) **Installing numpy and scipy**
   You can install any python3 package using the command pip3 install <packagename>
   e) **Installing jupyterlab**
   Install from pip using the command pip install jupyterlab
2. **Introduction to Python3**
   a) Printing your biodata on the screen
   b) Printing all the primes less than a given number
   c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. **Defining and Using Functions**
   a) Write a function to read data from a file and display it on the screen
   b) Define a boolean function *is palindrome*(<input>)
   c) Write a function *collatz(x)* which does the following: if x is odd, $x = 3x + 1$; if x is even, then $x = x/2$. Return the number of steps it takes for $x = 1$
   d) Write a function $N(m, s) = exp(-(x-m)^2/(2s^2))/sqrt(2\pi)s$ that computes the Normal distribution
4. **The package** numpy
   a) Creating a matrix of given order $m \times n$ containing *random numbers* in the range 1 to 99999
   b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
   c) Write a program to solve a system of n linear equations in n variables using matrix inverse
5. **The package** scipy **and** pyplot
   a) Finding if two sets of data have the same *mean* value
   b) Plotting data read from a file
   c) Fitting a function through a set a data points using *polyfit* function
   d) Plotting a histogram of a given data set
6. **The** strings **package**
   a) Read text from a file and print the number of lines, words and characters
   b) Read text from a file and return a list of all n letter words beginning with a vowel
   c) Finding a secret message hidden in a paragraph of text
   d) Plot a histogram of words according to their length from text read from a file

Cycle -2

7. Installing OS on Raspberry Pi
   a) Installation using PiImager
   b) Installation using image file
      - Downloading an Image
      - Writing the image to an SD card
        - using Linux
        - using Windows
      - Booting up

   Follow the instructions given in the URL
   https://www.raspberrypi.com/documentation/computers/getting-started.html
8. Accessing GPIO pins using Python
   a) Installing GPIO Zero library.
      First, update your repositories list:

      sudo apt update

      Then install the package for Python 3:

      sudo apt install python3-gpiozero

   b) Blinking an LED connected to one of the GPIO pin

   c) Adjusting the brightness of an LED

      Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.

9. Collecting Sensor Data
   a) DHT Sensor interface
   ◦ Connect the terminals of DHT GPIO pins of Raspberry Pi.
   ◦ Import the DHT library using ***import Adafruit_DHT***
   ◦ Read sensor data and display it on screen.

PROBABILITY AND STATISTICS

(For Civil Engineering branch)

II Yr– I Sem **L T P C**
3 1 0 4

Pre-requisites: Mathematics courses of first year of study.

Objectives: To learn

- The theory of Probability, and probability distributions of single and multiple random variables.
- The sampling theory and testing of hypothesis and making inferences.

UNIT-I: **10 L**

Probability

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Bayes' Rule.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions,Continuous Probability Distributions, Joint Probability Distribution.

UNIT-II: **10 L**

Expectation and discrete distributions

Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

Discrete Probability Distributions: Introduction and Motivation, Binomial Distribution, Poisson distribution and the poison process.

UNIT-III: **10 L**

Continuous Distributions and sampling

Continuous Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.

Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t –Distribution, F-Distribution.

UNIT-IV: **10 L**

Estimation & Tests of Hypotheses

Introduction, Statistical Inference, Classical Methods of Estimation,Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Single sample: Two samples: Estimating the ratio of two variances.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

UNIT-V: **8 L**

Applied Statistics

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

Course outcomes:

After learning the contents of this paper the student must be able to

- Apply the concepts of probability and distributions to some case studies
- Correlate the material of one unit to the material in other units

Text Books

1. Ronald E. Walpole,Raymond H. Myers,Sharon L. Myers,Keying Ye, Probability & Statistics For Engineers & Scientists, 9th Ed. Pearson Publishers,2022.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications,2002.

References

1. T.T. Soong, Fundamentals Of Probability And Statistics For Engineers, John Wiley & Sons, Ltd, 2004. .
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.

BUILDING MATERIALS, CONSTRUCTION AND PLANNING

II Yr – I Sem **L T P C**
3 0 0 3

Pre Requisites: Nil

Course Objectives: The objectives of the course is to

- List the construction material.
- Explain different construction techniques
- Understand the building bye-laws
- Highlight the smart building materials

UNIT - I

Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing.
Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics.

Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminum, Plastics.

UNIT – II

Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests.
Admixtures – mineral & chemical admixtures – uses.

UNIT - III

Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ; foundations – types ; Damp Proof Course ; Joinery – doors – windows – materials – types.
Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fire resistant materials and constructions.

UNIT - IV

Mortars, Masonry and Finishing's
Mortars: Lime and Cement Mortars
Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.
Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.
Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT – V

Building Planning: Principles of Building Planning, Classification of buildings and Building by laws.

Course Outcomes

After the completion of the course student should be able to

- Define the Basic terminology that is used in the industry
- Categorize different building materials, properties and their uses
- Understand the Prevention of damage measures and good workmanship
- Explain different building services

Text Books:

1. Building Materials and Construction – Arora &Bindra, Dhanpat Roy Publications,2010.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi,2005.

References:

1. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
2. Building Materials by Duggal, New Age International.
3. Building Materials by P. C. Varghese, PHI.
4. Building Construction by PC Varghese PHI.
5. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
6. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

Online Resources:

1. https://nptel.ac.in/courses/105/106/105106197/
2. https://nptel.ac.in/courses/105/102/105102175/

ENGINEERING GEOLOGY

II Year I-Sem

L	T	P	C
2	0	0	2

Pre Requisites: Nil

Course Objectives: The objective of this Course is

- To give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology, Geological Hazardous and Environmental Geology
- To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Planning and construction of major Civil Engineering projects

UNIT - I

Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.

Weathering of Rocks : Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like "Granite"

UNIT - II

Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartiz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite , Magnetite, Chrorite , Galena , Pyrolusite, Graphite, Magnesite, and Bauxite.

Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laerite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and case studies. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils.,

UNIT - IV

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods.

UNIT - V

Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Lithological, structural and ground water) in tunneling over break and lining in tunnels.

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

- Understand the site characterization and how to collect, analyze, and report geologic data using standards in engineering practice.
- Classify the fundamentals of the engineering properties of Earth materials and fluids.
- Understand the Rock mass characterization and the mechanics of planar rock slides and topples.

Text Books:

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014

References:

1. Rutley's elements of Mineralogy , C.D. Gribble , publisher Springer science
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications
4. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
5. Krynine& Judd, Principles of Engineering Geology &Geotechnics, CBS Publishers & Distribution
6. Engineering Geology by SubinoyGangopadhyay, Oxford university press.
7. Engineering Geology for Civil Engineers – P.C. Varghese PHI

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105106/

STRENGTH OF MATERIALS - I

II Year I-Sem

L	T	P	C
3	1	0	4

Pre Requisites: Engineering Mechanics

Course Objectives: The objective of this Course is

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers and beams for various types of simple loads
- To calculate the elastic deformation occurring in simple members for different types of loading.
- To show the plane stress transformation with a particular coordinate system for different orientation of the plane.
- To know different failure theories adopted in designing of structural members

UNIT – I

Simple Stresses And Strains:

Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic modulii, Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

STRAIN ENERGY – Resilience – Gradual, sudden, and impact loadings – simple applications.

UNIT – II

Shear Force and Bending Moment:

Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Flexural Stresses:

Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangularand circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses:

Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections.

UNIT –I V

Principal Stresses:

Introduction – Stresses on an oblique plane of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a

state of simple shear –Principal stresses – Mohr's circle of stresses – ellipse of stress - Analytical and graphical solutions.

Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory- Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

UNIT – V

Deflection of Beams:

Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load and couple -Mohr's theorems – Moment area method – Application to simple cases.

Conjugate Beam Method: Introduction – Concept of conjugate beam method - Difference between a real beam and a conjugate beam - Deflections of determinate beams with constant and different moments of inertia.

Course Outcome:

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

- Describe the concepts and principles, understand the theory of elasticity includingstrain/displacement and Hooke's law relationships; and perform calculations, related tothe strength of structured and mechanical components.
- Recognize various types loads applied on structural components of simple framing geometries and understand the nature of internal stresses that will develop within the components.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading
- Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress;

Text Books:

1) Strength of Materials by R.K Rajput, S.Chand & Company Ltd.
2) Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers.

References:

1) Mechanics of material by R.C.Hibbeler, Printice Hall publications.
2) Engineering Mechanics of Solids by Egor P.Popov,Printice Hall publications.
3) Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press.
4) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.
5) Strength of Materials by R. Subramanian, Oxford University Press.
6) Mechanics of Materials by Dr.B.C.Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain.

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105108/

FLUID MECHANICS

II Year I-Sem

L	T	P	C
3	1	0	4

Pre Requisites: Engineering Mechanics

Course Objectives: The objectives of the course are to

- Introduce the concepts of fluid mechanics useful in Civil Engineering applications.
- Provide a first level exposure to the students to fluid statics, kinematics and dynamics.
- Learn about the application of mass, energy and momentum conservation laws for fluid flows.
- Train and analyse engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students.
- To obtain the velocity and pressure variations in various types of simple flows
- To prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology.

UNIT – I

Properties of Fluid:

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

Fluid Statics:

Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. Pressure gauges. Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT - II

Fluid Kinematics:

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Streamline, pathline, streak line and stream tube; stream function, velocity potential function. One, two and three dimensional continuity equations in Cartesian coordinates.

Fluid Dynamics:

Surface and Body forces -Euler's and Bernoulli's equation; Energy correction factor; Momentum equation. Vortex flow – Free and Forced. Bernolli's equation to real fluid flows.

UNIT - III

Flow Measurement in Pipes

Practical applications of Bernoulli's equation: venture meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend.

Flow Over Notches & Weirs

Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

UNIT – IV

Flow through Pipes

Reynolds experiment, Reynolds number**,** Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes., water hammer in pipes and control measures, Principal of Hardy Cross method for pipe distribution network.

UNIT - V

Laminar & Turbulent Flow

Laminar flow through: circular pipes, annulus and parallel plates.

Boundary Layer Concepts

Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Definition of Drag and Lift and types drag, Magnus effect.

Course Outcomes (COs): Upon completion of this course, students should be able to:

- Understand the broad principles of fluid statics, kinematics and dynamics
- Define the basic terms used in fluid mechanics and characteristics of fluids and its flow.
- Classify the various fluid flows.
- Apply the continuity, momentum and energy principles.

Text Books

1. Fluid Mechanics by Modi and Seth ,Standard Book House,2018.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited,2015.

References.

1. TheoryandApplicationsofFluidMechanics,K.Subramanya,TataMcGrawHill
2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
3. Fluid MechanicsandMachinery,C.S.P.Ojha,R.BerndtssonandP.N.Chadramouli, OxfordUniversityPress, 2010
4. Fluid mechanics & Hydraulic Machines, Domkundwar&DomkundwarDhanpatRai&Co

5. Fluid Mechanics and Hydraulilc Machines, R.K. Bansal, Laxmi Publication Pvt Ltd.
6. Fluid Mechanics by R.C.Hibbeler, Pearson India Education Servieces Pvt. Ltderence Books

Online Resources:

1. https://nptel.ac.in/courses/105/103/105103192/
2. https://nptel.ac.in/courses/105/101/105101082/
3. https://nptel.ac.in/courses/112/105/112105269/
4. https://nptel.ac.in/courses/112/105/112105171/

COMPUTER AIDED CIVIL ENGINEERING DRAWING

II Year I-Sem

L	T	P	C
0	0	3	1.5

Pre Requisites: Building materials and Building Construction

Course Objectives: The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

List of Experiments:

1. Introduction to computer aided drafting and different coordinate system
2. Drawing of Regular shapes using Editor mode
3. Introduction GUI and drawing of regular shapes using GUI
4. Exercise on Draw tools
5. Exercise on Modify tools
6. Exercise on other tools (Layers, dimensions, texting etc.)
7. Drawing of building components like walls, lintels, Doors, and Windows. using CAD software
8. Drawing a plan of Building and dimensioning
9. Drawing a plan of a residential building using layers
10. Developing a 3-D plan from a given 2-D plan
11. Developing sections and elevations for given
    a) Single storied buildings b) multi storied buildings
12. Auto CAD applications in surveying, mechanics etc.

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

- Identify the Autocad commands for drawing 2D & 3D building drawings required for different civil engg applications.
- Sketch Civil Engineering Buildings as per aspect and orientation.
- Devise drawings as per user requirements and preparation of technical report.

Text Books:

1. Computer Aided Design Laboratory by M. N. SeshaPraksh& Dr. G. S. Servesh –Laxmi Publications,2016.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.,2013.

STRENGTH OF MATERIALS LABORATORY

II Year I-Sem

L	T	P	C
0	0	3	1.5

Pre Requisites: Strength of Materials

Course Objectives:

- Make measurements of different strains, stress and elastic properties of materials used in Civil Engineering.
- Provide physical observations to complement concepts learnt.
- Introduce experimental procedures and common measurement instruments, equipment, devices.
- Exposure to a variety of established material testing procedures and techniques.
- Different methods of evaluation and inferences drawn from observations.

List of Experiments:

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges
12. Continuous beam – deflection test.
13. Unsymmetrical bending, & Shear centre

Course Outcomes:

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

- Interpret a data acquisition system using various testing machines of solid materials
- Compute and Analyze engineering values (e.g. stress or strain) from laboratory measurements.
- Write a technical laboratory report.

ENGINEERING GEOLOGY LABORATORY

II Year I-Sem

L	T	P	C
0	0	2	1

Pre Requisites: Engineering Geology- Theory

Course Objectives: The objective of this lab is that to provide practical knowledge about physical properties of minerals, rocks, drawing of geological maps, showing faults, uniformities etc.

List of Experiments

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
7. Identification of rocks (Metamorphic Petrolody): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.
9. Simple structural Geology Problems(Folds, Faults & Unconformities)

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

- Understands the method and ways of investigations required for Civil Engineering projects.
- Identify the various rocks, minerals depending on geological classifications.
- Relate geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides and settlement.
- Write a technical laboratory report.

Lab Examination Pattern:

1. Description and identification of Six minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.
5 Microscopic identification of rocks.

ENVIRONMENTAL SCIENCE

II Year I-Sem

L	T	P	C
2	0	0	0

Pre-Requisites: Nil

Course Objectives:

- Creating the awareness about environmental problems among students.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating students to participate in environment protection and environment improvement.

UNIT-I:

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness. Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

UNIT–II:

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT–III:

Environmental Pollution: Definition, Cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards.

UNIT–IV:

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

UNIT–V:

Social Issues and the Environment: From Unsustainable to Sustainable development Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies - Wasteland reclamation. –Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

Course Outcomes: At the end of the course, it is expected that students will be able to:

1. Identify and analyze environmental problems as well as the risks associated with these problems
2. Understand what it is to be a steward in the environment Studying how to live their lives in a more sustainable manner

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission., Universities Press ,2012.
2. Environmental Studies by R. Rajagopalan, Oxford University Press,2015.

Reference Books:

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING

II Year II-Sem

L	T	P	C
3	0	0	3

Course Objectives: Objectives of this course are

- To introduce the concept of electrical circuits and its components.
- To introduce the concepts of diodes and transistors.
- To impart the knowledge of various configurations, characteristics and applications.

UNIT- I

Electrical Circuits: R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis,

Single Phase AC Circuits: R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

UNIT-II

Resonance: Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

Network Theorems: Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

UNIT- III

P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.

Rectifiers and Filters: P-N junction as a rectifier – Half Wave Rectifier, Ripple Factor – Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L-section Filters, π- section Filters.

UNIT- IV

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations. Transistor Biasing And Stabilization – Operating point, DC and AC load lines, Biasing – Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in VBE and β, Bias Compensation using Diodes and Transistors.

Transistor Configurations: BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

UNIT- V

Junction Field Effect Transistor: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

Special Purpose Devices: Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

Course Outcomes: After this course, the student will be able to

- Analyze and solve problems of electrical circuits using network laws and theorems.
- Identify and characterize diodes and various types of transistors.

Text books:

1.Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University,2017.
2.Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath Mc Graw Hill Education,2019.

References:

1.Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2.Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998.
3.Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
4.Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
5.Network Theory by N. C. Jagan and C. Lakshminarayana, B.S. Publications.
6.Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

Online Resources:

1. https://nptel.ac.in/courses/108/108/108108076/
2. https://nptel.ac.in/courses/108/105/108105053/

BASICS OF MECHANICAL ENGINEERING

II Year II-Sem

L	T	P	C
2	0	0	2

Instructional Objectives:

To familiarize civil engineering students with the

- Basic machine elements,
- Sources of Energy and Power Generation,
- Various manufacturing processes,
- Power transmission elements, material handling equipment

UNIT I:

Machine Elements: Cams: Types of cams and followers

Introduction to engineering materials-Metals, ceramics, composites-Heat treatment of metals

Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.

UNIT-II:

Power Transmission Elements: Gears terminology of spur, helical and bevel gears, gear trains. Belt drives(types). Chain drives.

Material handling equipment: Introduction toBelt conveyors, cranes, industrial trucks, bull dozers.

UNIT-III:

Energy:

Power Generation: External and internal combustion engines (layouts, element/component description, advantages, disadvantages, applications).

Refrigeration: Mechanical Refrigeration and types – units of refrigeration – Air Refrigeration system, details and principle of operation –calculation of COP.

Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

UNIT IV:

Manufacturing Processes: Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes(applications, advantages / disadvantages).

Welding: Types – Equipments –Techniques employed –welding positions-defects-applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

Casting: Types, equipments, applications.

UNIT V:

Machine Tools: Introduction to lathe, drilling machine, milling machine, grinding machine-Operations performed

Course Outcomes :

- Understand different types of rivets and its uses.
- Compare different types of refrigeration.
- Grade different manufacturing processes for casting and brazing.

Text Books:

1. Kumar, T., LeenusJesu Martin and Murali, G., Basic Mechanical Engineering, Suma Publications, Chennai,2007

References:

1. Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., Basic Mechanical Engineering, Scitech Publications, Chennai, 2000.
2. HajraChoudhary, S.K. and HajraChoudhary, A. K., Elements of Workshop TechnologyVols.I& II, Indian Book Distributing Company Calcutta, 2007.

3. Nag, P.K., Power Plant Engineering, Tata McGraw-Hill, New Delhi, 2008.
4. Rattan, S.S., Theory of Machines, Tata McGraw-Hill, New Delhi, 2010.

Online Resources:

1. https://nptel.ac.in/courses/112/105/112105123/
2. https://nptel.ac.in/courses/112/107/112107219/
3. https://nptel.ac.in/courses/112/106/112106293/
4. https://nptel.ac.in/courses/112/107/112107291/

SURVEYING

II Year II-Sem

L	T	P	C
3	0	0	3

Course Objectives:
The objective of the course is to:

- Know the principle and methods of surveying.
- Measure horizontal and vertical- distances and angles.
- Recording of observation accurately.
- Perform calculations based on the observation.
- Identification of source of errors and rectification methods.
- Apply surveying principles to determine areas and volumes and setting out curves.
- Use modern surveying equipment's for accurate results.

UNIT - I
Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.
Measurement of Distances and Directions
Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.
Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

UNIT - II
Leveling- Types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction.
Contouring- Characteristics and uses of Contours, methods of contour surveying.
Areas - Determination of areas consisting of irregular boundary and regular boundary.
Volumes -Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.

UNIT - III
Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.
Traversing: Methods of traversing, traverse computations and adjustments, Omitted measurements.

UNIT - IV
Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry, Determination of Horizontal distances and Elevations.

UNIT - V
Curves: Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves.
Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Field Procedure for total station survey, Errors in Total Station Survey, Global Positioning System- Principle and Applications.

Course Outcomes: Course will enable the student to:

- Apply the knowledge to calculate angles, distances and levels.
- Identify data collection methods and prepare field notes.
- Understand the working principles of survey instruments, measurement errors and corrective measures.

- Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies.

Text Books:

1. Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi,2002.
2. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi,2013.

References:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

Online Resources:

1. https://nptel.ac.in/courses/105/107/105107122/
2. https://nptel.ac.in/courses/105/104/105104101/
3. http://sl-iitr.vlabs.ac.in/sl-iitr/

STRENGTH OF MATERIALS – II

II Year II-Sem

L	T	P	C
3	0	0	3

Pre Requisites: Strength of Materials -I

Course Objectives: The objective of this Course is

- To understand the nature of stresses developed in simple geometries shafts, springs, columns &cylindrical and spherical shells for various types of simple loads
- To calculate the stability and elastic deformation occurring in various simple geometries for different types of loading.
- To understand the unsymmetrical bending and shear center importance for equilibrium conditions in a structural members of having different axis of symmetry.

UNIT – I

Torsion Of Circular Shafts :

Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure.

Springs : Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

UNIT – II

Columns And Struts:

Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory– Long columns subjected to eccentric loading – Secant formula – Empirical formulae — Rankine – Gordon formula- Straight line formula – Prof. Perry's formula.

Beam Columns: Laterally loaded struts – subjected to uniformly distributed and concentrated loads.

UNIT - III

Direct And Bending Stresses:

Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability-Overturning and sliding – stresses due to direct loading and bending moment about both axis.

UNIT – IV

Thin Cylinders :

Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders :

Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

UNIT – V

Unsymetrical Bending :

Introduction – Centroidal principal axes of section –Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis.

Shear Centre: Introduction - Shear centre for symmetrical and unsymmetrical (channel, I, T and L) sections

Course Outcome:

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

- Describe the concepts and principles, understand the theory of elasticity, and perform calculations, relative to the strength of structures and mechanical components in particular to torsion and direct compression;
- Evaluate the strains and deformation that will result due to theelastic stresses developed within the materials for simple types of loading.
- Analyze strength and stability of structural members subjected to Direct, and Directand Bending stresses;
- Understand and evaluate the shear center and unsymmetrical bending.

Text Books:

1) Strength of Materials by R.K Rajput, S.Chand& Company Ltd,2015.
2) Mechanics of Materials by Dr.B.CPunmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain,2017.

References:

1) Strength of Materials by R.Subramanian, Oxford University Press.
2) Mechanics of Materials by R.C.Hibbeler, Pearson Education
3) Engineering Mechanics of Solids by Popov E.P. Printice-Hall Ltd
4) Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
5) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.
6) Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd

Online Resources:

1. https://nptel.ac.in/courses/105/106/105106172/

HYDRAULICS & HYDRAULIC MACHINERY

II Year II-Sem

L	T	P	C
3	0	0	3

Pre Requisites: Nil

Course Objectives:

- To Define the fundamental principles of water conveyance in open channels.
- To Discuss and analyze the open channels in uniform and Non-uniform flow conditions.
- To Study the characteristics of hydroelectric power plant and its components.
- To analyze and design of hydraulic machinery and its modeling

UNIT-I

Dimensional Analysis and Hydraulic Similitude

Dimensional homogeneity – Rayleigh's method and Buckingham's pi methods – Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

Basics of Turbo Machinery

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular.

UNIT-II

Hydraulic Turbines – I

Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.

Hydraulic Turbines – II

Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

UNIT-III

Centrifugal Pumps

Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

Hydropower Engineering: Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

UNIT-IV

Open Channel Flow – Uniform Flow

Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channels, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient. Most economical sections. Computation of Uniform flow, Normal depth.

Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

UNIT-V

Open Channel Flow – Non-Uniform flow

Non uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.

Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

Course Outcomes:

At the end of the course the student will able to

- Apply their knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
- Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
- Apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems.
- Corelate the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages.

Text Books

1. Fluid Mechanics by Modi and Seth ,Standard Book House,2019.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited,2015

References

1. Fluid mechanics & Hydraulic Machines, Domkundwar&DomkundwarDhanpatRai&C
2. Fluid Mechanics by R.C.Hibbeler, Pearson India Education Servieces Pvt. Ltd
3. Fluid Mechanic & Fluid Power Engineering by D.S.Kumar (Kataria& Sons Publications Pvt. Ltd.).
4. Open channel flow by V.T.Chow (Mc.Graw Hill Book Company).
5. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, SumanChakraborthy, Mc Graw Hill Education (India) Private Limited
6. Hydraulic Machines by Banga& Sharma (Khanna Publishers).

STRUCTURAL ANALYSIS – I

II Year II-Sem

L	T	P	C
3	0	0	3

Pre Requisites: Strength of Materials –I

Course Objectives : The objective of the course is to

- Differentiate the statically determinate and indeterminate structures.
- To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
- Analyse the statically indeterminate members such as fixed bars, continuous beams and for various types of loading.
- Understand the energy methods used to derive the equations to solve engineering problems
- Evaluate the Influence on a beam for different static &moving loading positions

UNIT – I

Analysis of Perfect Frames: Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT – II

Moving Loads and Influence Lines: Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses - Equivalent uniformly distributed load -Focal length.

UNIT – III

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's theorem-Unit Load Method - Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.

Three Hinged Arches – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular archeshaving supports at different levels - Absolute maximum bending moment diagram for a three hinged arch.

UNIT-IV

Propped Cantilever and Fixed Beams: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

UNIT – V

Continuous Beams: Introduction-Continuous beams - Clapeyron's theorem of three moments- Analysis of continuous beams- Shear force and bending moment diagramsand Elastic curve with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - effect of sinking of supports.

Slope Deflection Method: Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminaciesfor frames- Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method iincluding Side Sway - Shear force and bending moment diagrams and Elastic curve.

Course Outcomes:

At the end of the course the student will able to

- Apply knowledge of mathematics, science, and engineering.
- Analyse the statically indeterminate bars and continuous beams
- Devise strength behavior of members for static and dynamic loading.
- Solve the stiffness parameters in beams and pin jointed trusses.
- Understand the indeterminacy aspects to consider for a total structural system.
- Identify, formulate, and solve engineering problems with real time loading

Text Books:

1) Structural Analysis Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers,2015.
2) Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd,2010.

References:

1) Structural analysis T.S Thandavamoorthy, Oxford university Press
2) Structural Analysis by R.C.Hibbeler, Pearson Education
3) Basic Structural Analysis by K.U.Muthu*et al.*,I.K.International Publishing House Pvt.Ltd
4) Mechanics of Structures Vol – I and II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
5) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Education Pvt. Ltd.
6) Fundamentals of Structural Analysis by M.L.Gamhir, PHI Learning Pvt. Ltd

SURVEYING LABORATORY

II Year II-Sem

L	T	P	C
0	1	2	2

Pre Requisites: Surveying Theory

Course Objectives:

- To impart the practical knowledge in the field- measuring distances, directions, angles,
- To determining R.L.'s areas and volumes
- To set out Curves
- To stake out points
- To traverse the area
- To draw Plans and Maps

List of Experiments

1. Surveying of an area by chain, and compass survey (closed traverse) & plotting.
2. Determine of distance between two inaccessible points with compass.
3. Radiation method, intersection methods by plane table survey.
4. Levelling – Longitudinal and cross-section and plotting.
5. Measurement of Horizontal and vertical angle by theodolite.
6. Trigonometric leveling using theodolite.
7. Height and distances using principles of tachometric surveying.
8. Determination of height, remote elevation, distance between inaccessible points using total station.
9. Determination of Area using total station and drawing map.
10. Traversing using total station for drawing contour map.
11. Stake out using total station.
12. Setting out Curve using total station.

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

- Apply the principle of surveying for civil engineering applications.
- Extract from areas the contour maps using different measuring equipment at field level.
- Write a technical laboratory report.

BASIC ELECTRICAL & ELECTRONICS LABORATORY

II Year II-Sem

	L	T	P	C
Basic Electrical Engineering Laboratory	**0**	**0**	**2**	**1**

List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
   (b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit

Basic Electronics Engineering Laboratory

• There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimetersetc will be given. Lectures on measurement techniques and error calculation will also have to be organized.
• 3 hours per week must be kept, initially for practical lectures, and later for tutorials.

List of Experiments:

1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.

Course Outcomes :

- Apply maximum power theorem for measuring R-L-C series circuit.
- Defend Thevenin's theorem and Norton's theorems.
- Use the Superposition theorem to find the power output.

FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY

II Year II-Sem **L T P C**
0 0 2 1

Pre Requisites: FM & HHM Theory

Course Objectives

- To identify the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- To explain the standard measurement techniques of fluid mechanics and their applications.
- To illustrate the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- To analyze the laboratory measurements and to document the results in an appropriate format.

List of Experiments

1. Verification of Bernoulli's equation.
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Calibration of Venturimeter / Orifice Meter.
4. Calibration of Triangular / Rectangular/Trapezoidal Notch.
5. Determination of Minor losses in pipe flow.
6. Determination of Friction factor of a pipe line.
7. Determination of Energy loss in Hydraulicjump.
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes.
10. Performance CharacteristicsofPelton wheel turbine.
11. Performance Characteristics of Francis turbine.
12. Performance characteristics of Keplan Turbine.
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump.

Course Outcomes

Students who successfully complete this course will have demonstrated ability to:

- Describe the basic measurement techniques of fluid mechanics and its appropriate application.
- Interpret the results obtained in the laboratory for various experiments.
- Discover the practical working of Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- Compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
- Write a technical laboratory report.

INDIAN CONSTITUTION

II Year II-Sem **(Mandatory Course)**

L	T	P	C
2	0	0	0

Course Objectives

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

Unit I:

History of Making of the Indian Constitution- History of Drafting Committee.

Unit II:

Philosophy of the Indian Constitution- Preamble Salient Features

Unit III:

Contours of Constitutional Rights &Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.
-

Unit IV:

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive,President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Unit V:

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Unit VI:

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Course Outcomes

Students will be able to:

- Understand the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Explain the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Cite the passage of the Hindu Code Bill of 1956.

Suggested Reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Department of Civil Engineering

Minor Programme – Construction technology and management

S.N.o	Name of the Course	L	T	P	Credits
1	Project Management	3	0	1.5	4.5
2	Construction methods and Equipment	3	0	3	3.0
3	Construction Economics and Finace	3	0	0	3.0
4	Lean Construction	3	0	0	3.0
5	Facility, Quality and Safety management	3	1.5	0	4.5

Department of Civil Engineering

HonoursProgramme – Civil Engineering

S.N.o	Name of the Course	L	T	P	Credits
1	Water Resources Systems analysis	3	0	0	3.0
2	Advanced Reinforced Concrete Design	3	0	2	4.0
3	Structural Dynamics	3	0	0	3.0
4	Ground improvement Engineering	3	0	2	4.0
5	intelligent Transport Systems	3	0	0	3.0
6	Advanced surveying	2	0	2	3.0

Note: The BOS of Civil Engineering feels that the motive/idea of implementing Minor programme of different discipline is to increase placement potential of a student. Keeping in view of this the civil engineering minor can also offered to the UG students of the Department. Further B.Tech (Honours) in the corresponding faculty is to be implemented by Considering the advance courses in the different specializations (strengths) existing in the department and has to be given the nomenclature as B.Tech(houners) only not with any superlatives. If you add any superlative it won't give sense of honors of the corresponding faculty.

STRUCTURAL ANALYSIS – II

III Year I-Sem

L	T	P	C
3	0	0	3

Pre Requisites: SA- I

Course Objectives:

The objectives of the course are to

- Identify the various actions in arches.
- Understand classical methods of analysis for statically indeterminate structures.
- Differentiate the approximate and numerical methods of analysis for indeterminate structures.
- Find the degree of static and kinematic indeterminacies of the structures.
- Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

UNIT – I

Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

Moment Distribution Method - Analysis of continuous beams with and without settlement of supports using - Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames -Shear force and Bending moment diagrams, Elastic curve.

UNIT – II

Kani's Method: Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side SwayusingKani's Method - Shear force and bending moment diagrams - Elastic curve.

Indeterminate Trusses: Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies –Castigliano's second theorem.

UNIT – III

Approximate Methods of Analysis: Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method and Factor method - Analysis of multi-storey frames for gravity loads - Substitute Frame method - Analysis of Mill bents, BMD, Elastic curve.

UNIT – IV

Matrix Methods of Analysis: Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods -Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

UNIT- V

Influence Lines For Indeterminate Beams: Introduction – muller Breslau principle, influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

Course Outcomes

After the completion of the course student should be able to

- Analyze the two hinged arches.
- Solve statically indeterminate beams and portal frames using classical methods.

- Understand the shear force and bending moment diagrams for indeterminate structures.
- Understand the stiffness matrix and analyze the beams by matrix methods.

Text Books:

1) Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers,2015.
2) Structural Analysis Vol I & II by G.S. Pandit S.P.Gupta Tata McGraw Hill Education Pvt. Ltd,2010.

References:

1. Indeterminate Structural Analysis by K.U.Muthu et al., I.K.International Publishing House
2. Pvt.Ltd.
3. Structural analysis T.S Thandavamoorthy, Oxford university Press.
4. Mechanics of Structures Vol –II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
5. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.
6. Examples in Structural Analysis by William M.C.McKenzie, Taylor & Francis.
7. Structural Analysis by R. C. Hibbeler, Pearson Education.
8. Structural Analysis by Devdas Menon, Narosa Publishing House.
9. Advanced Structural Analysis by A.K.Jain, Nem Chand & Bros.

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105166/

GEOTECHNICAL ENGINEERING

III Year I-Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Engineering Geology, Applied Mechanics, Fluid Mechanics

Course Objectives: The objectives of the course are to

- Understand the formation of soil and classification of the soils.
- Determine the Index & Engineering Properties of Soils.
- Determine the flow characteristics & stresses due to externally applied loads.
- Estimate the consolidation properties of soils.
- Estimate the shear strength and seepage loss.

UNIT – I

Introduction: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density.

Index properties of soils: Grain size analysis – consistency limits and indices – I.S. Classification of soils.

UNIT –II

Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law- permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils .

Effective stress & seepage through soils: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT –III

Stress distribution in soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

Compaction: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV

Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT - V

Shear strength of soils: Importance of shear strength **–** Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

Course Outcomes :

At the end of the course the student will able to

- Characterize and classify the soils
- Estimate seepage, stresses under various loading conditions and compaction characteristics
- Analyse the compressibility of the soils
- Understand the strength of soils under various drainage conditions.

Text books:

1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International PvtLtd, 2016.
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.2018.
3. Basic and Applied Soil Mechanics, Gopal Ranjan and A.S.R. Rao, New Age Int. Publishers,2019, 3rd Edition.
4. Geotechnical Engineering, V.N.S. Murthy, CBS Publishers, 2018, First Edition.
5. Introduction to Geotechnical Engineering, Braja M. Das and N. Sivakugan, Cengage Learning, 2015, Second Edition.

References:

1. Foundation Engineering by P.C.Varghese, PHI.
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
3. Principals of Geotechnical Engineering by BrajaM.Das, Cengage Learning Publishers.
4. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
5. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
6. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.
7. Soil Mechanics and Foundation by byB.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi.

Online Resources:

1. https://nptel.ac.in/courses/105/101/105101201/
2. https://nptel.ac.in/courses/105/105/105105168/
3. https://nptel.ac.in/courses/105/101/105101160/

STRUCTURAL ENGINEERING – I (RCC)

III Year I-Sem

L	T	P	C
3	1	0	4

Pre-Requisites: Structural Analysis I & II

Course Objectives:

The objectives of the course are to

- Identify the basic components of any structural system and the standard loading for the RC structure.
- Identify and tell the various codal provisions given in IS. 456.
- Describe the salient feature of limit state method, compare with other methods and the concepts of limit state of collapse and limit state of serviceability.
- Evaluate the behaviour of RC member under flexure, shear and compression, torsion and bond.

UNIT -I

Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility– Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load– Forces – What is meant by Design? – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000.

Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing of reinforcement

UNIT – II

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement

UNIT - III

Design of Two-way slabs with different end conditions, one way slab, and continuous slab Using I S Coefficients Limit state design for serviceability for deflection, cracking and codal provisions.

UNIT – IV

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

UNIT – V

Design of foundation - Different types of footings – Design of wall footing – Design of flat isolated square, rectangularl, circular footings and combined footings for two columns.

Course Outcomes

After the completion of the course student should be able to

- Compare and Design the singly reinforced, doubly reinforced and flanged sections.
- Design the axially loaded, uniaxial and biaxial bending columns.
- Classify the footings and Design the isolated square, rectangular and circular footings.
- Distinguish and Design the one-way and two-way slabs.

Text Books:

1. Limit state designed of reinforced concrete – P.C.Varghese, PHI Learning Pvt. Ltd.,2008.
2. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers.,2011.

References :

1. Reinforced concrete design by S.Unnikrishna Pillai &Devdas Menon, Tata Mc.Graw Hill.
2. Reinforced concrete structures, Vol.1, by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd.
3. Fundamentals of Reinforced concrete design by M.L. Gambhir,Printice Hall of India Pvt.Ltd.,
4. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press.
5. Design of concrete structures by J.N.Bandhyopadhyay PHI Learning Private Limited.
6. Design of Reinforced Concrete Structures by I.C.Syal and A.K.Goel, S.Chand& company.
7. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.

List of codes :

1. **IS456:2000 -** Plain and Reinforced Concrete - Code of Practice
2. **SP: 16(S&T): 1980** Design for reinforced concrete to IS 456: 1978

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105105/

TRANSPORTATION ENGINEERING

III Year I-Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Nil

Course Objectives:

- Introduction to highway development in India an understanding factors to be considered while aligning of highways.
- To understand the necessity of highway geometric design.
- To introduce traffic characteristic, road safety and parking issues.

UNIT I

Highway development and planning:

Highway Development in India – Necessity for Highway Planning- Different Road Development Plans; Classification of Roads - Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports – Highway Project.

UNIT – II

Highway geometric design: Importance of Geometric Design - Design controls and Criteria - Highway Cross Section Elements - Sight Distance Elements- Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance - Design of Horizontal Alignment - Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

UNIT – III

Traffic engineering &regulations :

Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data Collection and Presentation - Speed studies - Data Collection and Presentation - Origin & Destination studies, Parking Studies – On street & Off street Parking - Road Accidents - Causes and Preventive Measures - Accident Data Recording – Condition Diagram and Collision Diagrams - Traffic Signs – Types and Specifications – Road Markings - Need for Road Markings-Types of Road Markings - Design of Traffic Signals – Webster Method.

UNIT – IV

Intersection design :

Types of Intersections – Conflicts at Intersections – Requirements of At-Grade Intersections - Types of At-Grade Intersections: Channelized and Unchannelized Intersections – Traffic Islands - Types of Grade Separated Intersections - Rotary Intersection – Concept of Rotary – Design Factors of Rotary – Advantages and Limitations of Rotary Intersections.

UNIT - V

Parking Analysis and Traffic Safety: Types of parking facilities – On-street parking and Off-street Parking facilities; Parking studies and analysis- Parking Inventory Study, Parking Usage Study By Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Index, Parking Volume.

Course Outcomes:

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

- Understand the longitudinal and cross sectional elements of a highway.
- Design the horizontal and vertical alignment of roads.
- Understanding the concept of intersections, interchanges.
- Solve the various parking parameters.

Text books:

1. Highway Engineering – S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 7th edition (2010).
2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna Publications – 6th Edition – 2015.

References:

1. Principles of Traffic and Highway Engineering – Garber &Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali and Dr.N.BLal - Khanna Publications.
3. Highway Engineering – S.P.Bindra , Dhanpat Rai & Sons. – 4th Edition (1981)

Online Resources:

1. https://nptel.ac.in/courses/105/101/105101087/
2. https://www.youtube.com/watch?v=5zKC_aq4ypM

CONCRETE TECHNOLOGY
(Professional Elective – I)

III Year I-Sem

L	T	P	C
3	0	0	3

Pre Requisites: Building Materials, Planning and Construction

Course Objectives: The objectives of the course are to

- Know different types of cement as per their properties for different field applications.
- Understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
- Know field and laboratory tests on concrete in plastic and hardened stage.
-

UNIT I

Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT - II

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, 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, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.

UNIT – III

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, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT - IV

Hardened Concrete : Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.

Testing of Hardened Concrete: Compression tests– Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT – V

Mix Design : Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

Special Concretes: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Course Outcomes:

After the completion of the course student should be able to

- Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
- Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
- Use advanced laboratory techniques to characterize cement-based materials.
- Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.

Text books:

1. Concrete Technology by M.S.Shetty. – S.Chand& Co. 2012
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford university Press, New Delhi,2006.

References:

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2.Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers
3. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

IS Codes:

IS 269:1989 Specification for ordinary Portland cement, 33 grade (fourth revision)
IS 8112: 1989 Specification for 43 grade ordinary Portland cement (first revision)
IS 12269: 1987 Specification for 53 grade ordinary Portland cement
IS 4031(PT1): 1996 - Methods of physical tests for hydraulic cement: Part 1 Determination of fineness by dry sieving (second revision)
IS 4031(PT2): 1999 Methods of physical tests for hydraulic cement: Part 2 Determination of fineness by specific surface by Blaine air permeability method (second revision)
IS 4031(PT3): 1988 Methods of physical tests for hydraulic cement: Part 3 Determination of soundness (first revision)
IS 4031(PT4): 1988 Methods of physical tests for hydraulic cement: Part 4 Determination of consistency of standard cement paste (first revision)
IS 4031(PT5): 1988 Methods of physical tests for hydraulic cement: Part 5 determination of initial and final setting times (first revision)
IS 4031(PT6): 1988 Methods of physical tests for hydraulic cement: Part 6 determination of compressive strength of hydraulic cement (other than masonry cement) (first revision)
4031(PT7): 1988 Methods of physical test for hydraulic cement: Part 7 Determination of compressive strength for masonry cement (first revision)
IS 4031(PT8): 1988 Methods of tests for hydraulic cement: Part 8 determination of Mar-00 transverse and compressive strength of plastic mortar using prism (first revision)
IS 4031(PT9): 1988 Methods of physical tests for hydraulic cement: Part 9 Determination of heat of hydration (first revision)
IS 4031(PT10): 1988 Methods of physical test for hydraulic cement: Part 10 Determination of drying and shrinkage (first revision)
IS 4031(PT11): 1988 Methods of physical tests for hydraulic cement: Part 11 Determination of density (first revision)
IS 4031(PT12): 1988 Methods of physical tests for hydraulic cement: Part 12 Determination of air content of hydraulic cement mortar (first revision)
IS 4031(PT13): 1988 Methods of physical tests for hydraulic cement: Part 13 Measurement of water retentivity of masonry cement (first revision)

IS 4031(PT14): 1989 Methods of physical test for hydraulic cement Part 14Determination of false set
IS 4031(PT15): 1991 Methods of physical test for hydraulic cement Part 15Determination of fineness by wet sieving
IS 2386(PT2): 1963 Methods of test for aggregates for concrete Part 1 Particle size and shape
IS 2386(PT2): 1963 Methods of test for aggregates for concrete part 2 estimation of deleterious materials and organic impurities
IS 2386(PT3): 1963 Methods of test for aggregates for concrete Part 3 specific gravity,density, voids, absorption and bulking
IS 2386(PT4): 1963 Methods of test for aggregates for concrete: Part 4 Mechanical properties
IS 2386(PT5): 1963 Methods of tests for aggregates for concrete: Part 5 Soundness
IS 2386(PT6): 1963 Methods of test for aggregates for concrete: Part 6 Measuring mortar making properties of fine aggregates
*IS 2386(PT7): 1963 Methods of test for aggregates for concrete: Part 7 Alkali aggregate reactivity
*IS 2386(PT8): 1963 Methods of test for aggregates for concrete: Part 8 Petrographic examination
IS 383:1970 Specification for coarse and find aggregates from natural sources for concrete (second revision)
IS 1199:1959 - Methods of Sampling and Analysis of Concrete
*IS 516: 1959 Method of test for strength of concrete
IS 5816: 1999 Method of test for splitting tensile strength of concrete (first revision)
IS 13311(PT1): 1992 Methods of non-destructive testing of concrete: Part 1 Ultrasonic pulse velocity
IS 13311(PT2): 1992Methods of non-destructive testing of concrete: Part 2 Rebound hammer
IS 456:2000 - Plain and Reinforced Concrete - Code of Practice
IS 10262 :2009 "Concrete Mix Proportioning – Guidelines"
IS 383 :1993 "Specification For Coarse And Fine Aggregates From Natural Sources For Concrete"

Online Resources:

1. https://nptel.ac.in/courses/105/102/105102012/

BUILDING INFORMATION MODELLING
(Professional Elective – I)

	L	T	P	C
III Year I-Sem	**3**	**0**	**0**	**3**

Pre Requisites: None

UNIT I :

Introduction to Building Information Modelling (BIM): Background of Building Information Modelling (BIM); Components of BIM, BIM Focus, Users of BIM information and Project Delivery Methods using BIM.

UNIT II :

BIM in Pre-Construction Phase: Conceptual Design in Terms Shape, Orientation, Site in Terms of Green Strategy, Architectural BIM, Architectural Drafting, Architecture 3D Rendering. Structural BIM Design: Systems and Materials, Structural Rebar Detailing, Green Design Decisions. BIM Analysis: Daylighting, Energy Analysis and Energy Cost; Documentation.

UNIT III :

BIM in Planning and Construction Phase: BIM In Fabrication, BIM In Construction Gatekeeping, 4D BIM – Construction Scheduling, 5D – Construction Cost Estimation, Quantity Take off, Clash Detection and Construction Logistics.

UNIT IV :

Case studies on BIM: Architectural BIM in Residential Buildings and 3D Rendering Services;

UNIT V :

Structural BIM Modelling for Multi Storey– Residential Building and BIM Implementation during New Construction.

Course Outcomes:

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

- Study the background of BIM and its role in construction management.
- Apply BIM in construction design, planning and construction phases.
- Comprehend the role of BIM approach in design coordination to aid in decision making
- Apply BIM for case studies.

Text Books:

1. Building Information Modelling (BIM) in Design, Construction and Operations De Wilde, P., Mahdjoubi, L., & Garrigós, A. G., WIT Press, 2019, Volume 192.

2. Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations, Kymmell, W., McGraw-Hill Education, 2008, First Edition.

Reference Books:

1. Integrated Practice in Architecture: Mastering Design-Build, Fast-Track, And Building Information Modelling, Elvin, G., John Wiley & Sons, 2007, First Edition.

2. Organization and digitization of information about buildings and civil engineering works, including building information modelling -- Information management using building. information modelling: Concepts and principles, BS EN ISO 19650-1, The British Standards Institution, 2018.

3. Organization and digitization of information about buildings and civil engineering works, including building information modelling -- Information management using building information modelling: Delivery phase of the assets. BS EN ISO 19650-2, The British Standards Institution, 2018.

Online Resources:

1. https://youtu.be/iRMA2TauyvM
2. https://youtu.be/mVsy_ycUD1Q

INTRODUCTION TO OFFSHORE STRUCTURES
(Professional elective – I)

III Year I-Sem

L	T	P	C
3	0	0	3

Pre Requisites: FM & Hydraulics, Structural Analysis, RC Design

Course Objectives:

- The subject provide a knowledge on offshore structures.
- Analysis and design of offshore structures.

UNIT I

Types of offshore structures selection function - Physical, environmental and geotechnical aspects of marine and offshore construction. Loads and responses of offshore structures. Foundations for offshore structures. Introduction to design and installation of offshore piled platforms,concrete offshore platforms, Moored floating structures and Submarine pipelines

UNIT II

Wave theories

Wave generation process, small and finite amplitude wave theories.

UNIT III

Forces of offshore structures

Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.

UNIT IV

Offshore soil and structure modeling

Different types of offshore structures, foundation modeling and structural modeling.

UNIT V

Analysis and design of offshore structures

Static method of analysis, foundation analysis and dynamics of offshore structures. Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

Course Outcomes

- Recognise the functions of different offshore structures.
- Apply wave theory to offshore structures.
- Devise methods for modeling offshore structures.

Text Books

1. Construction of Marine and Offshore structures, Gerwick, C., CRC Press,2007.
2. Design and construction of Port and Marine structures, Alonzo Def. Quinn., McGraw Hill Book co.2000.
3. Hand Book of Offshore Engineering (Vols. 1 & 2)", Chakrabarti., S.K., Elsevier Publications,2005.

References

1. Dynamic Analysis of Offshore Structures, Brebbia C.A. and Walker,Newnes, Butterworth, London, 1978.
2. 'Mechanics of Wave Forces on Offshore Structures', Sarpakaya T and Isaacson M., Van Nostrand Reinhold, New York, 1981.
3. 'Dynamics of Marine Structures', Hallam M.G., Heaf N.J. and Wootton, L.R., CIRIA Publications, Underwater Engg., Group, London, 1978.
4. 'Introduction to Offshore Structures', Graff W.J., Gulf Publishing Co., Houston, Texas, 1981.

5. 'Dynamics of Structures', Clough R.W. and Penzien J., II Edition, McGraw-Hill, 1992.
6. 'Wind Effects on Structures', Simiu E. and Scanlan R.H., Wiley, New York, 1978.
7. Codes of Practices (latest versions) such as API RP-2A, Bureau Veritas etc.
8. Behaviour of Offshore Structures (BOSS) and other Conferences on Offshore Engineering, Proceedings of Offshore Technology Conference (O.T.C.).

ECONOMICS AND FINANCIAL ANALYSIS

III Year I Sem

L	T	P	C
3	0	0	3

Course Objectives:

- To prepare engineering students to analyze cost/ revenue/ financial data.
- To make economic and financial analysis in decision making process.
- To examine the performance of companies engaged in engineering.

UNIT I

Introduction to Engineering Economics- Basic Principles and Methodology of Engineering Economics– Fundamental Concepts - Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods - Elasticity of Demand - Theory of Firm – Supply- Elasticity of Supply.

UNIT II

Macro Economic Concepts: National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

UNIT III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT IV

Capital Budgeting Techniques: Significance of Capital Budgeting - cash flows-Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

UNIT V

Introduction to Accounting: Accounting Principles (GAPP), concepts, conventions- - Double entry system of Book keeping – Accounting rules- Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet. (Simple Problems).

Course Outcome:

At the end of the course the student should be able to

- Evaluate present and future worth of the alternate projects
- Appraise projects by using traditional and DCF Methods.
- Evaluate cost benefit analysis of projects
- Solve BEP of different alternative projects.

Text books

1. Engineering Economics, Henry Malcom Steinar-Principles, McGraw Hill Pub.
2. Business Economics - Theory and Applications, D.D.Chaturvedi, S.L.Gupta, International Book House Pvt. Ltd. 2013.

References :

3. Accounting, Jain and Narang, Kalyani Publishers.
4. Cost Accounting, Arora, M.N, Vikas Publication.
5. Financial Management, S.N.Maheshwari, Vikas Publishing House.

CONCRETE TECHNOLOGY AND HIGHWAY ENGINEERING LABORATORY

III Year I-Sem

L	T	P	C
0	0	2	1

Pre-Requisites: Building Materials, Concrete Technology, Highway Materials

Course Objectives:

The objectives of the course are

- To learn laboratory tests and their procedures cement, fine aggregate, coarse aggregates and bitumen.
- To Evaluate fresh concrete properties.
- To Understand the test procedures for characterization of Concrete and bituminous mixes.

List of Experiments

I. Test on Cement & sand

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement
5. Compressive strength of cement
6. Bulking of sand, Bulk and compact densities of fine and coarse aggregates

II Test on Fresh Concrete

Workability test on concrete

1. Slump test
2. CF (compact factor test)
3. Vee-bee Test
4. Flow Table Test

III Test on Hardened concrete

5. Compression test on cubes & Cylinders
6. Flexure test
7. Split Tension Test
8. Modulus of Elasticity

IV Test on Aggregates (Coarse and Fine)

9. Specific gravity (Pycnometer and wire basket),water absorption
10. Shape(Flakiness and elongation indices)
11. Impact and abrasion value tests
12. Crushing test

V Tests on Bitumen and Bituminous concrete

1. Penetration, softening point
2. Ductility and viscosity

VI. Traffic surveys

1.Volume
2. Speed
3. Parking

Course Outcomes :

Student shall be able to

- Categorize the test on materials used Civil Engineering Building & Pavement constructions.
- Perform the tests on concrete for its characterization.
- Design Concrete Mix Proportioning by Using Indian Standard Method.
- Examine the tests performed for Bitumen mixes.
- Prepare a technical report.

Text Books:

1. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons,2000.
2. Highway Material Testing manual, Khanna ,Justo and Veeraraghavan, Nemchand Brothers,2018.

IS Codes:

IS 269:1989 Specification for ordinary Portland cement, 33 grade (fourth revision)
IS 8112: 1989 Specification for 43 grade ordinary Portland cement (first revision)
IS 12269: 1987 Specification for 53 grade ordinary Portland cement
IS 4031(PT1): 1996 - Methods of physical tests for hydraulic cement: Part 1 Determination of fineness by dry sieving (second revision)
IS 4031(PT2): 1999 Methods of physical tests for hydraulic cement: Part 2 Determination of fineness by specific surface by Blaine air permeability method (second revision)
IS 4031(PT3): 1988 Methods of physical tests for hydraulic cement: Part 3 Determination of soundness (first revision)
IS 4031(PT4): 1988 Methods of physical tests for hydraulic cement: Part 4 Determination of consistency of standard cement paste (first revision)
IS 4031(PT5): 1988 Methods of physical tests for hydraulic cement: Part 5 determination of initial and final setting times (first revision)
IS 4031(PT6): 1988 Methods of physical tests for hydraulic cement: Part 6 determination of compressive strength of hydraulic cement (other than masonry cement) (first revision)
4031(PT7): 1988 Methods of physical test for hydraulic cement: Part 7 Determination of compressive strength for masonry cement (first revision)
IS 4031(PT8): 1988 Methods of tests for hydraulic cement: Part 8 determination of Mar-00 transverse and compressive strength of plastic mortar using prism (first revision)
IS 4031(PT9): 1988 Methods of physical tests for hydraulic cement: Part 9 Determination of heat of hydration (first revision)
IS 4031(PT10): 1988 Methods of physical test for hydraulic cement: Part 10 Determination of drying and shrinkage (first revision)
IS 4031(PT11): 1988 Methods of physical tests for hydraulic cement: Part 11 Determination of density (first revision)
IS 4031(PT12): 1988 Methods of physical tests for hydraulic cement: Part 12 Determination of air content of hydraulic cement mortar (first revision)
IS 4031(PT13): 1988 Methods of physical tests for hydraulic cement: Part 13 Measurement of water retentivity of masonry cement (first revision)
IS 4031(PT14): 1989 Methods of physical test for hydraulic cement Part 14Determination of false set
IS 4031(PT15): 1991 Methods of physical test for hydraulic cement Part 15Determination of fineness by wet sieving
IS 2386(PT2): 1963 Methods of test for aggregates for concrete Part 1 Particle size and shape
IS 2386(PT2): 1963 Methods of test for aggregates for concrete part 2 estimation of deleterious materials and organic impurities
IS 2386(PT3): 1963 Methods of test for aggregates for concrete Part 3 specific gravity,density, voids, absorption and bulking
IS 2386(PT4): 1963 Methods of test for aggregates for concrete: Part 4 Mechanical properties
IS 2386(PT5): 1963 Methods of tests for aggregates for concrete: Part 5 Soundness
IS 2386(PT6): 1963 Methods of test for aggregates for concrete: Part 6 Measuring mortar making properties of fine aggregates
*IS 2386(PT7): 1963 Methods of test for aggregates for concrete: Part 7 Alkali aggregate reactivity
*IS 2386(PT8): 1963 Methods of test for aggregates for concrete: Part 8 Petrographic examination

IS 383:1970 Specification for coarse and find aggregates from natural sources for concrete (second revision)
IS 1199:1959 - Methods of Sampling and Analysis of Concrete
*IS 516: 1959 Method of test for strength of concrete
IS 5816: 1999 Method of test for splitting tensile strength of concrete (first revision)
IS 13311(PT1): 1992 Methods of non-destructive testing of concrete: Part 1 Ultrasonic pulse velocity
IS 13311(PT2): 1992Methods of non-destructive testing of concrete: Part 2 Rebound hammer
IS 456:2000 - Plain and Reinforced Concrete - Code of Practice
IS 10262 :2009 "Concrete Mix Proportioning – Guidelines"
IS 383 :1993 "Specification For Coarse And Fine Aggregates From Natural Sources For Concrete"
IS 1201 -1220 (1978) "Methods for testing tars and bituminous materials"

GEO TECHNICAL ENGINEERING LABORATORY

III Year I-Sem

L	T	P	C
0	0	2	1

Pre-Requisites: Soil Mechanics (Co-requisite)

Course Objectives:

- To obtain index and engineering properties of locally available soils.
- To understand the behavior of these soil under various loads.

LIST OF EXPERIMENTS

1. Atterberg Limits (Liquid Limit, Plastic Limit, and shrinkage limit)
2. a) Field density by core cutter method and
   b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Differential free swell index (DFSI) test

Course Outcomes:

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

- Classify and evaluate the behavior of the soils subjected to various loads.
- Apply the SPT test to different soils.
- Determine the of Coefficient of consolidation and swell index.

Text Books:

1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International PvtLtd,2016.
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors,2018.
3. Basic and Applied Soil Mechanics, Gopal Ranjan and A.S.R. Rao, New Age Int. Publishers,2019, 3rd Edition.

REFERENCE:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International.
2. Geotechnical Engineering, V.N.S. Murthy, CBS Publishers, 2018, First Edition.
3. Introduction to Geotechnical Engineering, Braja M. Das and N. Sivakugan, Cengage Learning, 2015, Second Edition.

ADVANCED COMMUNICATIONS SKILLS LABORATORY

III Year I-Sem

L	T	P	C
0	0	2	1

Pre-Requisites: English

Course Objectives:

- The purpose of this course is to develop the students competence in communication at an advanced level. assuming that the students are fairly proficient in the basic communication skills of listening, speaking, reading and writing in English.
- To train them in communicating efficiently in the workplace and professional contexts.

1. Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Learning Outcomes

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. Prescribed Lab Manual: A book titled ***A Course Book of Advanced Communication Skills(ACS) Lab*** published by Universities Press, Hyderabad.

6. Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 8th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

Course Outcomes:

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

- Communicate efficiently in the work place up professioal context.
- Write a technical report.
- Use time efficiently for better project management.

Text Books

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. English Language Communication : A Reader cum Lab Manual Dr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
3. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.

References :

4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.

6. The Basics of Communication:A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
7. English Vocabulary in Use series, Cambridge University Press 2008.
8. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
9. Handbook for Technical Communication by David A. McMurrey& Joanne Buckley. 2012. Cengage Learning.
10. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. Handbook for Technical Writing by David A McMurrey& Joanne Buckely CENGAGE Learning 2008.
12. Job Hunting byColmDownes,Cambridge University Press 2008.
13. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
14. **English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hil 2009.**
15. Books on **TOEFL/GRE/GMAT/CAT/IELTS** by Barron's/DELTA/Cambridge University Press.
16. **International English for Call Centres**by Barry Tomalin and Suhashini Thomas, Macmillan Publishers.2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

Advanced Communication Skills Lab Practicals:

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. **Seminar/ Professional Presentation**
2. **A Report on the same has to be prepared and presented.**

* ***Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***
* ***Not more than two students to work on each mini project.***
* ***Students may be assessed by their performance both in oral presentation and written report.***

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

III Year I-Sem

L	T	P	C
2	0	0	0

Course Objectives:

To train the students to :

- Understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems.
- To apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

UNIT - I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search).

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning.

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes.

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

Course Outcomes :

- Classify basic search strategies for application to AI problems.
- Use probabilistic reasoning for search trees.
- Correlate the domain knowledge for learning and decision process.

Text Books:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

2.Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.

Reference Books:

1. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

Learning resources :

1.www.techopedia.com
2.www.classcentral.com

ENVIRONMENTAL ENGINEERING

III Year . II-Sem

L	T	P	C
3	0	0	3

Pre Requisites: Fluid Mechanics

Course Objectives:
This subject provides the

- Knowledge of water sources, water treatment, design of distribution system waste water treatment,
- Safe disposal methods.
- Characteristics of waste water, sludge digestion.

UNIT – I
Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT – II
Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

UNIT - III
Characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing **–** ultimate disposal of sewage – sewage farming –self purification of rivers.

UNIT – IV
Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters –ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

UNIT – V
Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of particulates –Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

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

- Assess characteristics of water and wastewater and their impacts.
- Estimate quantities of water and waste water and plan conveyance components.
- Design components of water and waste water treatment plants.
- Understand the issues of air pollution and control.

Text Books:

1. Environmental Engineering by H.S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2016
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.

References:

1. Environmental Engineering I and II by BC Punmia, Std. Publications.
2. Environmental Engineering I and II by SK Garg, Khanna Publications.
3. Environmental Pollution and Control Engineering CS Rao,Wiley Publications.
4. Water and Waste Water Technology by Steel, Wiley.
5. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
6. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011.
7. Water and Waste Water Technology by Mark J Hammar and Mark J. HammarJr.Wiley, 2007.
8. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice, Hall, New Jersey.
9. Introduction to Environmental Engineering by P. AarneVesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
10. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill Publication.
11. Water supply & sanitary engineering by G.S. Birdie, J.S. Birdie, Dhanpat Rai Publishing company, 9th edition, 2014.

Online Resources:

1. http://cpheeo.gov.in/cms/manual-on-water-supply-and-treatment.php
2. http://cpheeo.gov.in/cms/manual-on-operation--and-maintenance-of-water-supply-system-2005.php
3. http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php
4. https://nptel.ac.in/courses/105/105/105105201/
5. https://nptel.ac.in/courses/105/106/105106119/
6. https://nptel.ac.in/courses/105/104/105104102/

FOUNDATION ENGINEERING

III Year II-Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Geotechnical Engineering

Course Objectives:

- To Plan Soil exploration programme for civil Engineering Projects.
- To check the stability of slopes.
- To determine the lateral earth pressures and design retaining walls.
- To determine the Bearing capacity of Soil.
- To design pile group foundation.

UNIT – I

Soil exploration: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Borelogs and preparation of soil investigation report.

UNIT – II

Slope stability: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices – Taylor's Stability Number- stability of slopes of earth dams under different conditions.

UNIT – III

Earth pressure theories: Active , Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.

Retaining walls: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

UNIT –IV

Shallow Foundations- Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

UNIT -V

Pile Foundation: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction.

Course Outcomes:

At the end of the course the student will able to

- Understand the principles and methods of Geotechnical Exploration.
- Identify the suitability of soils and check the stability of slopes.
- Solve the lateral earth pressures and check the stability of retaining walls.
- Analyse and design the shallow and deep foundations.

Text books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt . Ltd, New Delhi,2016.
2. Principals of Geotechnical Engineering by BrajaM.Das, Cengage Learning Publishers.

References:

1. Soil Mechanics and Foundation Engineeringby VNS Murthy, CBS Publishers and Distributors.

2. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
4. Geotechnical Engineering by S. K.Gulhati&Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.
5.Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, New york.
6. Handbook of Machine Foundations, Srinivasulu, P. And Vaidyanathan, C. V, Tata McGraw-Hill, New Delhi, 2017
7.. Soil Mechanics and Foundation Engineering, Murthy V.N.S - CBS publications, New Delhi, 2018.
8. Principles of Foundation Engineering, Braja.M. Das, Cengage Learning India Private Limited, 2011, Seventh Edition
9. Advanced Soil Mechanics, Das, B.M, CRC Press, London & NewYork, 5th Edition, 2020

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ce39/preview
2. https://nptel.ac.in/courses/105/105/105105168/

STRUCTURAL ENGINEERING – II (Steel)

III Year II-Sem

L	T	P	C
3	1	0	4

Pre-Requisites: Structural Analysis I & II

Course Objectives

The objectives of the course is to

- Explain the mechanical properties of structural steel, plasticity, yield .
- Describe the salient features of Limit State Method of design of Steel structures.
- Identify and explain the codal provisions given in IS. 800.
- Analyze the behaviour of steel structures under tension, compression and flexure.
- Design the tension, compression , flexural members and plate girder.
- Design the connection in steel structure, `build -up member and (bolted and welded).

UNIT – I

Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths- deflection limits – serviceability – stability check. Design of Connections– Different types of connections – **Bolted connections** –Design strength – efficiency of joint–prying action - Welded connections – Types of welded joints – Design requirements - Design of Beam-column connections- Eccentric connections - Type I and Type II connection – Framed connection.

UNIT – II

Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.

Design of compression members – Buckling class – slenderness ratio –Design of simple compression members - laced – battened columns – splice – column base – slab base.

UNIT – III

Plastic Analysis;Plastic moment – Plastic section modulus - Plastic analysis of continuous beams

Design of Flexural Members –Laterally supported and unsupported Beams – Design of laterally supported beams- Bending and shear strength/buckling – Built-up sections - Beam splice.

UNIT – IV

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice.

UNIT – V

Design of Industrial Structures;Types of roof trusses - loads on trusses – wind loads - Purlin design – truss design.

Note: Design of structural members include detailed sketches

Course Outcomes:

After the completion of the course student should be able to

- Analyze the tension members, compression members.
- Design the tension members, compression members and column bases and joints and connections.
- Analyze and Design the beams including built-up sections and beam and connections.
- Identify and Design the various components of welded plate girder including stiffeners.

Text Books:

1.Design of steel structures by S.K.Duggal,Tata Macgrawhill publishers,2000,2nd Edition

2.Design of steel structures by N.Subramanian,Oxford University press,2008

Reference Books:

1. Design of steel structures by K.S.Sairam,Pearson Educational India, 2nd Edition,2013
2. Design of steel structures by Edwin H.Gayrold and Charles Gayrold,Tata Mac-grawhill publishers,1972
3. Design of steel structures by L.S.JayaGopal,D.Tensing,Vikas Publishing House

List of codes:

IS800-2007 - General Construction in Steel — Code of Practice

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105162/

HYDROLOGY & WATER RESOURCES ENGINEERING

III Year II-Sem

L	T	P	C
3	1	0	4

Pre-Requisites: Fluid Mechanics & HHM

Course Objectives:

This course provides

- The description of hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle. And its components.
- Water requirement for irrigation.
- Connectivity of hydrology to the field requirement.

Unit - I

Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering. Sources of data.

Precipitation

Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic, Theissen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

Unit - II

Abstractions from precipitation: Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapo transpiration, measurement of evapo transpiration, evapo transpiration equations: Penman and Blaney &Criddle Methods, potential evapo transpiration over India, actual evapo transpiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

Runoff

Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

Unit - III

Hydrographs

Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow-Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function - Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

Unit - IV

Groundwater Hydrology

Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law.

Well Hydraulics - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

Crop Water Requirements– Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigationwater;Soil-water relationships, rootzone soilwater,infiltration, consumptiveuse,irrigationrequirement,frequencyofirrigation;Methodsofapplyingwater to the fields: surface, sub-surface, sprinkler and trickle /drip irrigation.

Unit - V

Canal Systems: Canal systems, alignment of canals, canallosses, estimation of design discharge. Design of channels –rigid boundary channels, alluvial channels, Regime channels, Kennedy' sand Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals-Types of lining-Advantages and disadvantages. Drainage of irrigated lands-necessity, methods.

Course Outcomes:

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

- Understand the different concepts and terms used in engineering hydrology.
- Identify and explain various formulae used in estimation of surface and Ground water hydrology components.
- Demonstrate their knowledge to connect hydrology to the field requirement.

Text Books

1. Hydrology by K. Subramanya (Tata McGraw-Hill),2013.
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar and Garg Khanna publishers,2006.

Reference Books

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill).
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications.
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age International).
5. Irrigation Engineering, G L Asawa, WileyEastern.

Online resources

1. https://nptel.ac.in/courses/105/105/105105110/

PRESTRESSED CONCRETE
(Professional Elective – II)

III Year II-Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Reinforced Concrete Design

Course Objectives
The objectives of the course are to

- Understand the principles & necessity of prestressed concrete structures.
- Know different techniques of prestressing.
- Get the knowledge on various losses of prestress.
- Understand Analysis and design of prestressed concrete members.
-

UNIT I:
Introduction: Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.

UNIT II:
Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of Prestressing like Hoyer system, MagnelBlaton system, Freyssinet system and Gifford- Udall System-Lee McCall system.Losses of Prestress: Loss of prestress in pretensioned and post tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT III:
Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout. Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions.

UNIT IV:
Transfer of Prestress in Pretensioned Members : Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions.

UNIT V:
Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.
Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- Deflection of determinate composite beam.

Course Outcomes
After the completion of the course student should be able to

- Understand the knowledge of evolution of process of prestressing.
- Apply the knowledge of various prestressing techniques.
- Develop skills in analysis , design of prestressed structural elements as per the IS codal provisions.

Text Books :-

1. Prestressed Concrete by N.Krishna Raju, Tata Mc Graw Hill Book co,2006.
2. Prestressed Concrete by Dayaratnam Pasala, Oxford and I B H Publishing.2001

References :

1. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
2. Prestressed Concrete by N. Rajagopalan Narosa Publishing House.
3. Prestressed Concrete by K.U.Muthu PHI Learning Pvt. Ltd.
4. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
5. IS 1343:2012 – Code of practice for Prestressed concrete.

Online Resources:

1. https://nptel.ac.in/courses/105/106/105106117/

OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING
(Professional Elective – II)

III Year II-Sem

L	T	P	C
3	0	0	3

Pre- requisites:-Mathematics I & II

Course Objectives:

- To understand the theory of optimization methods.
- To develop algorithms for solving various types of optimization problems.

UNIT 1

Introduction to Optimization: Introduction - Historical developments - Engineering applications of Optimization - Statement of an Optimization problem - Classification of Optimization problems - Optimization Techniques. Optimization by calculus: Introduction - Unconstrained functions of a single variable - Problems involving simple constraints - Unconstrained functions of several variables - treatment of equality constraints - Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

UNIT II

Linear Programming: Introduction - Applications of linear programming - standard form of a linear programming problem - Geometry of linear programming problems - Definitions and theorems - Solution of a system of Linear simultaneous equations - Pivotal reduction of a general system of equations - Motivation of the Simplex Method - Simplex Algorithm - Two phases of the simplex method. non-Linear Programming: Introduction - Unimodal Function - Unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method - Fibonacci method - Golden section method - Comparison of elimination methods - Unconstrained optimization techniques - Direct search methods - Random search methods - grid search method - Univariate method - Powell's method - Simplex method - Indirect search methods - Gradient of a function - Steepest descent method - Conjugate gradient - Newton's method.

UNIT III

Dynamic Programming: Introduction - Multistage decision processes - concept of sub-optimization and the principle of optimality - computational procedure in dynamic programming - example illustrating the Calculus method of solution - example illustrating the Tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming - Additional applications.

UNIT IV

Network Analysis: Introduction - Elementary graph theory - Network variables and problem types - Minimum-cost route - Network capacity problems - Modification of the directional sense of the network.

UNIT V

Application of Optimization techniques to trusses, Beams and Frames.

Course Outcomes: The student will be able to

- Understand the basic principles of optimization.
- Formulate optimization models for a wide range of civil engineering problems.
- Solve optimization models.

Text Books:

1. Introduction to Optimum Design by J.S.Arora. McGraw Hill New York,2016.
2. Optimization: Theory and Applications by S.S.Rao.Wiley & Sons,2000.

References

1. Numerical Optimization Techniques for Engineering Design with applications by G.N.Vanderplaats. McGraw-Hill, New York.
2. Elements of Structural Optimization by R.T.Haftka and Z.Gurdal. Kluwer Academic Publishers, Dordrecht, 1992.
3. Optimum Structural Design by U.Kirsch. McGraw-Hill, New York.
4. Optimum Design of Structures by K.I.Majid. Wiley, New York.

INTRODUCTION TO COMPOSITE MATERIALS
(Professional Elective – II)

III Year II-Sem

L	T	P	C
3	0	0	3

Pre- Requisites: -Structural Engineering –I (RCC)

Course Objectives:-

- To Study the properties of Composite Laminate and its macro mechanical analysis.
- To study the behavior of glass fibre reinforced laminates.
- To design GRP box beams and stressed skinned roof structures.

UNIT - I

Introduction: Requirements of structural materials, influence of nature of materials in structural form, Nature of structural materials- Homogeneous materials, composite materials.

UNIT - II

Macro mechanical Properties of composite Laminate: Introduction, Assumptions and Idealizations, Stress Strain relationships for composite Laminate- Isotropic, Orthotropic laminate, Strength Characteristics- Basic concepts, Strength hypothesis for isotropic and Orthotropic laminate. Macro mechanical Analysis of composite Laminate: Introduction, Assumptions and Limitations, Stiffness characteristics of glass reinforced laminate- Stress- Strain relationships in continuous, discontinuous fibre laminate, Strength characteristics of glass reinforced laminate- Strengths in continuous, discontinuous fibre laminate.

UNIT - III

Behaviour of Glass Fibre-Reinforced laminates: Introduction, Stiffness characteristics of Laminated composites- Behaviour of Laminated beams and plates, Strength characteristics of Laminated composites- Strength analysis and failure criteria, Effect of inter laminar structures. Glass Reinforced Composites: Introduction, Continuously reinforced laminates- uni-directionally and multi directionally continuously reinforced laminates, discontinuously reinforced laminates – Stiffness and Strength properties.

UNIT - IV

GRP properties relevant to structural Design: Introduction, Short-term strength and stiffness-Tensile, Compressive, Flexural and Shearing. Long term strength and stiffness properties, Temperature effects, Effect of fire, Structural joints- Adhesive, mechanical, Combinational, Transformed sections.

UNIT - V

Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performance- Modulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.
Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

Course Outcomes:-

After the completion of the course the student will be able to

- Acquire the knowledge about the composite laminates, glass fibre reinforced laminates and their strength characteristics.
- Develop skills in design of GRP box beams & Stressed skinned roof structure.

Text books:

1. GRP in Structural Engineering M.Holmes and D.J.Just.2000.
2. Mechanics of Composite materials and Structures by Madhujith Mukhopadhyay; Universities Press,2004.

DISASTER MITIGATION AND MANAGEMENT
(Open Elective – I)

III Year II-Sem

L	T	P	C
3	0	0	3

Course Objectives:
The objectives of the course are

- To Understand basic concepts in Disaster Management.
- To Understand Definitions and Terminologies used in Disaster Management.
- To Understand Types and Categories of Disasters.
- To Understand the Challenges posed by Disasters.
- To understand Impacts of Disasters Key Skills.

UNIT I:
Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT II
Disasters- Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT III
Disaster Impacts- Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV
Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT V
Disasters, Environment and Development- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Course Outcomes:
The student will able to

- Apply Disaster Concepts to Management
- Analyze Relationship between Development and Disasters.
- Understand Categories of Disasters and realization of the responsibilities to society.

Text Books:
1. Disaster Risk Reduction in South Asia, Pradeep Sahni, 2004, Prentice Hall.
2. Handbook of Disaster Management: Techniques & Guidelines, Singh B.K., 2008, Rajat Publication.

Reference Books:

1. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
2. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.
3. Disaster Management, Ghosh G.K., 2006, APH Publishing Corporation.

Online Resources :

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

ENVIRONMENTAL ENGINEERING LABORATORY

III Year II-Sem

L	T	P	C
0	0	2	1

Pre-Requisites:Nil

Course Objectives:

The objectives of the course are to

- Perform the experiments to determine water and waste water quality .
- Understand the water & waste water sampling, their quality standards .
- Estimate quality of water, waste water, Industrial water.

Practical Work: List of Experiments

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/DO
12. Determination of Residual Chlorine
13. Total count No.
14. Noise level measurement

Course outcomes :

After the completion of the course student should be able to

- Understand about the equipment used to conduct the test procedures.
- Perform the experiments in the lab.
- Examine and Estimate water, waste water, air and soil quality.
- Compare the water, air quality standards with prescribed standards set by the local governments.
- Develop a report on the quality aspect of the environment.

Text Books:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.

2. Introduction to Environmental Engineering by P. AarneVesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.

References

1. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.

COMPUTER AIDED DESIGN LABORATORY

III Year II-Sem

L	T	P	C
0	0	2	1

Pre-Requisites: Computer Aided Civil Engineering Drawing or AUTO CAD Principles –Excel- Structural Engineering -1 & 2

Course Objectives : The objectives of the course are to

- Learn the usage of any fundamental software for design .
- Create geometries using pre-processor.
- Analyse and Interpret the results using post processor .
- Design the structural elements.

LIST OF EXPERIMENTS

1. Analysis &Design determinate structures using a software.
2. Analysis &Design of fixed & continuous beams using a software.
3. Analysis & Design of Plane Frames.
4. Analysis &Design of space frames subjected to DL & LL.
5. Analysis &Design of residential building subjected to all loads (DL,LL,WL,EQL).
6. Analysis & Design of Roof Trusses.
7. Design and detailing of built up steel beam.
8. Developing an excel template for foundation design.
9. Detailing of RCC beam and RCC slab.
10. Detailing of RCC column and RCC footing.

Course Outcomes :

After the completion of the course student should be able to

- Model the geometry of real world structure Represent the physical model of structural element/structure.
- Analyze real world structure.
- Interpret from the Post processing results.
- Design the structural elements and a system as per IS Codes.

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Textbooks :

1. Computer Aided Optimum Design of Structures , S.Hernandez , A.J.Kassab & C.A.Brebbla , WIT Press.
2. Computer Aided Design , Dr.Sadhu Singh.
3. Computer Aided Structural Design ,D.Clarke , Wiley-Blackwell , 2020.

INTRODUCTION TO CYBER SECURITY

III Year II-Sem **L T P C**

Prerequisites: Nil **2 0 0 0**

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes.
- To give an overview of the cyber laws.
- To study the defensive techniques against these attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.
Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.
Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.
Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Course Outcomes:

The students will be able to

- Understand cyber-attacks, types of cybercrimes, cyber laws
- Understand how to protect them self and ultimately the entire Internet community from such attacks.

Text Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

References:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

Online resources :

1.https:// www.mygreatlearning.com
2.https://sl-cources.iitb.ac.in
3.https://iitk.talentsprint.com

PROJECT STAGE - I

IV Year I-Sem

L	T	P	C
0	0	6	3

Each Student shall start the project work during the IVth Year –I Semester as per the instructions of the of the Project Guide/Project Supervisor assigned by the HEAD Of The DEPARTMENT. Out of a total 200 marks allotted for the Project Work, 60 marks shall be for CIE(Continuous Project Evaluation) and 140 marks for SEE(EndSemester Viva –Voce Examination.

MINI PROJECT/SUMMER INTERNSHIP

IV Year I-Sem

L	T	P	C
0	0	4	2

A) There shall be an Industrial oriented Mini Project in Collaboration with an Industry of the relevant specialization to be registered immediately after III Year II Semester Examinations and taken up during the summer vacation for about eight weeks duration.

B) The industry oriented Mini-Project shall be submitted in a report form, and a presentation of the same shall be made before a Committee, which evaluates it for 100 marks. The committee shall consist of Head of the Department, the supervisor of Mini-Project, and a Senior Faculty Member of the Department. There shall be no internal marks for Industry oriented Mini-Project. The Mini-Project shall be evaluated in the IV year I Semester.

ESTIMATION, COSTING AND PROJECT MANAGEMENT

IV Year I-Sem

L	T	P	C
3	0	0	3

Pre-Requisites:NIL

Course Objectives:
The subject provides

- Process of estimations required for various work in construction.
- To have knowledge of using SOR & SSR for analysis of rates on various works.
- Basics of planning tools for a construction projects.

UNIT – I
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Detailed Estimates of Buildings.

UNIT – II
Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.

UNIT – III
Rate Analysis – Working out data for various items of work over head and contingent charges.

UNIT-IV
Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation -Standard specifications for different items of building construction.

UNIT-V
Construction project planning- Stages of project planning: pre-tender planning,pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion

NOTE : Number of Exercises Proposed :
1.Three in flat Roof & one in Sloped Roof
2.Exercises on Data – three Nos.

Course Outcomes:

- Understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
- Judge the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
- Understand how competitive bidding works and how to submit a competitive bid proposal.
- Optimize construction projects based on costs.
- Understand how to construct projects are administered with respect to contract structures and issues.
- Apply ideas and understandings to others with effective communication processes.

Text Books

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Project Planning with PERT and CPM Punmia, B.C., Khandelwal, K.K., , Laxmi Publications, 2016.

Reference books:

1. Estimating and Costing by G.S. Birdie.
2. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014.
3. Standard Schedule of rates and standard data book by public works department.
4. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
5. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.
6. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011.
7. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006.
8. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson. Education India, 2015.

Online Resources:

1. https://nptel.ac.in/courses/105/106/105106149/
2. https://nptel.ac.in/courses/105/103/105103093/

IRRIGATION AND HYDRAULIC STRUCTURES
(Professional Elective – III)

IV Year I-Sem

L	T	P	C
3	0	0	3

Pre-Requisites: Hydraulics& Hydraulic machinery, Hydrology &Water Resources Engineering.

Course Objectives:

- To study various types of storage works.
- Understand diversion headwork, their components.
- Design principles for irrigation structures construction.

UNIT - I

Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation – Life of Reservoir.. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

UNIT - II

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

UNIT- III

Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage. Spillways: types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.

UNIT- IV

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations,-Silt Ejectors and Silt Excluders Weirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

UNIT- V

Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall. Canal regulation works, principles of design of cross and distributary head regulators, types of Canal escapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainage works: types, selection of suitable type, various types, design considerations for cross drainage works.

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

- Explain types of water retaining structures for multiple purposes and its key parameters considered for planning and designing.
- Understand details in any Irrigation System and its requirements.
- Analyze and Design of a irrigation system components.

Text Books:

1. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg, Khanna Publishers,2006.
2. Irrigation engineering by K. R. Arora Standard Publishers,2018.
3. Irrigation and water power engineering by Punmia& Lal, Laxmi publications Pvt. Ltd., New Delhi,2017.

References:

1. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.
3. Irrigation Theory and Practice by A. M. MichealVikas Publishing House 2015.
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105110/
2. https://nptel.ac.in/courses/126/105/126105010/
3. https://nptel.ac.in/courses/126/105/126105019/
4. https://nptel.ac.in/courses/105/102/105102159/

FINITE ELEMENT METHODS
(Professional Elective – III)

IV Year I-Sem

L	T	P	C
3	0	0	3

Pre- Requisites: None

Course Objectives :

- To study the various methods of structural analysis
- To develop stiffness and flexibility matrices for various load conditions.

UNIT I
Matrix Methods of Structural Analysis: Review of concepts – Actions and displacements – compatibility – indeterminacy – Member and joint loads – Flexibility Matrix formulation - Stiffness Matrix formulation.

UNIT II
Introduction to Finite Element Method: Background and general description of the method – summary of the analysis procedure.

UNIT III
Theory of Finite Element method: Discretisation concept- Concept of element – various elements shapes – displacement models – Convergence- shape functions – condensation of internal degrees of freedom-Summary of analysis procedure.

UNIT IV
Finite Element Analysis: Development of shape functions for different elements-Spring- Truss-Beam-Plane elements- Plane stress and plane strain-Assemblage of elements construction of stiffness matrix and loads – boundary conditions –patch test-solution of overall problem.

UNIT V
Isoparametric Formulation: Concept of Isoparametric element – One and Two dimensional elements-Natural coordinates- Development of Higher order elements- Lagrange – Serendipity –Interpolation-formulation of element stiffness and loads.
Application to Solid Mechanics problems: Analysis of Trusses – Beams – Frames and 3D space elements.

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

- Develop shape functions and stiffness matrices different finite elements.
- Develop global stiffness matrices and global load vectors.
- Apply natural and arial coordinate systems to constant strain triangle and linear strain.
- Analyze planar structural systems using finite element modeling.

Text Books:

1. Finite Element Analysis: Theory and Programming, C Krishnamoorthy, McGraw Hill Pub., 2017, 2nd Edition.
2. Introduction to Finite elements in Engineering, Tirupathi chandra Patla and Belugundu, Pearson, 2015, 4th Edition,.
3. The Finite element Method in Engineering, S. S. Rao, Elsevier Publication, 2020, 6th Edition.

Reference Books:

1. Finite Element Method: Its Basic and Fundamentals, O.C. Zeinkiewicz, Butterworth Heinemann, 2007, 6th Edition.
2. Textbook of Finite Element Analysis, P. Seshu, PHI Pub., 2003
3. Introduction To Finite Element Method, J. N. Reddy, McGraw Hill Pub., 2020, 4th Edition
4. Fundamentals of finite element analysis, David Hutton, McGraw Hill Pub., 2017.
5. Numerical Methods in Finite Element Analysis, Bathe K J, Prentice-Hall civil engineering and engineering mechanics series, 2016.

Online Resources:

1. https://nptel.ac.in/courses/105/105/105105041/

PAVEMENT MANAGEMENT SYSTEMS
(Professional Elective – III)

IV Year I-Sem **L T P C**
3 0 0 3

Pre-requisites: Transportation Engineering

Course Objectives :

- Select suitable database strategies for a given pavement.
- The pavement condition using functional and structural methods and their determination.
- Type and timing of maintenance required for given pavement.
- Life cycle cost of pavements and implementation strategies.

UNIT I

Introduction to PMS: Historical perspectives of PMS, Evolution of PMS concepts, basic components of PMS, Network and Project levels of PMS, data needs, GIS applications, database design, inventory and monitoring databases, planning pavement investments process and benefits of pavement management.

UNIT II

Pavement Performance Models: General concepts, pavement evaluation with respect to user cost, pavement evaluation technologies, techniques for developing prediction models deterministic, probabilistic, expert system of PMS models; remaining service life, AASHO, CRRI, and HDM models, deterioration concepts and modeling, priority programming methods.

UNIT III

Design Alternatives: Design alternatives, evaluation, and selection, a framework for pavement design, design objectives and constraints, generating alternative pavement design strategies, economic evaluation methods, economic evaluation of alternative pavement design strategies, and selecting optimal design strategies.

UNIT IV

Pavement Prioritization Techniques: General concepts, ranking methods and procedures, prioritization based on benefit-cost ratio, mathematical optimization for prioritization of M, R&R Work Programs, Markov and heuristic approaches and ANN techniques for Prioritization of M, R&R Work programs.

UNIT V

Pavement life cycle cost analysis: implementation of PMS, operational issues, system complexity, feedback, other institutional issues, and PMS case studies.

Course Outcomes:

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

- Identify and select suitable database strategies for a given pavement.
- Determine the pavement condition using functional and structural methods.

- Decide the type and timing of maintenance required for given pavement.
- Estimate the life cycle cost of pavements and implementation strategies.

Textbooks:

1. Pavement Management for Airports, Roads and Parking Lots, Shahin, M.Y., Chapman & Hall, New York, 1994.
2. Modern Pavement Management, Haas, R., W. R., Hudson, and J. P. Zaniewski. Modern Pavement Management. Krieger Publishing Company. Malabar, Florida, 1994.

References :

1. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation. Hudson, W. R., R. Haas, and W. Uddin., McGraw Hill. New York, 1997.
2. Southeast Michigan Council of Governments. Pavement Management System, SEMCOG, 1997.
3. Transportation Association of Canada. Pavement Design and Management Guide. Transportation Association of Canada, Ottawa, 1997.
4.Structural Design of Asphalt Pavements NCHRP, TRR, and TRB Special Reports.

Online Resources:

1. https://www.youtube.com/watch?v=lDv67Eppaos
2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/
3. http://www.trb.org/Publications/PubsNCHRPProjectReportsAll.aspx

PHOTOGRAMMETRY AND UAV
(Professional Elective – IV)

IV Year I-Sem

L	T	P	C
3	0	0	3

Pre-requisites: None

Course Objectives:

- To understand the different terminology of photogrammetric.
- To understand the unmanned air vehicle and its applications.
- To understand different scanning methods.

UNIT I
Introduction to photogrammetry: Photogrammetric terms, applications, advantages, limitations and a brief history, types of camera: metric vs. non-metric, types of photogrammetry

UNIT II
Aerial photogrammetry: Geometry of vertical/near-vertical aerial photographs: Orthographic vs. perspective projection, Map vs. photograph, scale of photograph, estimate the scale, relief displacement and its determination, parallax in photographs and measurement, stereoscopy.

UNIT III
UAV: History of unmanned air vehicle (UAV) development. Classifications and components of UAVs – Design standards and Regulatory aspects – Environment, Budget & Time, Airframe Design & Payload, Flight planning, Mosaicing, Ground control, Feature detection and mapping, Point cloud, 3D Models, DEM generation, Orthophoto generation, UAV Applications.

UNIT IV
Laser Scanning: Principles, methods of scanning, scanning of terrestrial structures, monuments, LiDAR characteristics and types of systems.

UNIT V
Integrated systems (UAV, Car, Aircraft etc.): Applications and some case studies: Mining. exploration, SLAM.

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

- Classify the photogrammetry methods and their applications.
- Determine the scale, ground coordinates and the aerial extent of aerial photographs.
- Explain various methods of photogrammetric techniques.
- Apply the photogrammetric skills to extract the earth surface features.

Text Books:

1. Elements of Photogrammetry, Wolf, Paul, R.. Fourth Ed., McGraw-Hill, 2014
2. Introduction to UAV Systems, Paul Gerin Fahlstrom & Thomas James Gleason., Wiley Publications, 2012.
3. Introduction to Modern Photogrammetry, Mikhail, E., M., Bethel, J. S. and McGlone, J. C.,

John Wiley & Sons, 2001.

References:

1. Topographic laser ranging and scanning Principles and Processing, Toth, C., K., Shan, J. CRC Press.
2. Close Range Photogrammetry and 3D Imaging., Thomas Luhmann, Stuart Robson, Stephen Kyle & Jan Boehm., Walter de Gruyter GmhH, 2nd Edition, 2014.

Online Resources:

1. https://nptel.ac.in/courses/105/104/105104100.

URBAN TRANSPORTATION PLANNING
(Professional Elective –IV)

IV Year I-Sem

L	T	P	C
3	0	0	3

Course Objectives:

- The course introduces students to the fundamentals of Urban transportation engineering.
- It familiarizes students with contemporary transportation planning issues and methods of analysis.

Unit I:

Introduction: Fundamentals of Transportation, Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems.

Unit II:

Data Collection And Inventories: Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

Unit III:

Travel Demand issues: Travel Attributes, Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

Unit IV:

Demand and supply planning Plan Preparation and Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis.

Unit V:

Metropolitan cities: Issues in urban mobility, integrating land use and transport planning; Overview of urbanization process, city structure and urban activity and infrastructure systems, Economic and social significance of urban infrastructure systems; Transport's Role in tackling Social Inclusion.

Course Outcomes:

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

- Identify urban transportation problems.
- Estimate urban travel demand.
- Understand urban transport networks.
- Identify urban transport corridors and urban transportation plans.

Text books

1. Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London Ltd,2000.
2. Introduction to Urban System Planning - B.G.Hutchinson; Mc Graw Hill.,2020.

References:

1. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers.2000.
2. Lecture notes on UTP - Prof. S. Raghavachari ,R.E.C.Warangal.1984.
3. Metropolitan transportation planning – John W. Dickey, Tata Mc Graw Hill, New Delhi,1975.

Online Resources:

1. https://rdso.indianrailways.gov.in
2. https://www.iricen.gov.in
3. https://www.icao.int
4. https://www.faa.gov/

ADVANCED STRUCTURAL DESIGN
(Professional Elective –IV)

IV Year I-Sem

L	T	P	C
3	0	0	3

Course Objectives

- To understand the design concepts of various structural elements .
- To design the water tanks and girders.

UNIT – I

Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles & Design of Counter fort Retaining walls.

UNIT – II

Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

UNIT – III

Design of RCC Intz Tanks – Top dome – Top ring beam, circular wall, Bottom ring beam – conical dome. Bottom dome, design of bracings and staging, design of foundations.

UNIT – IV

Introduction – Definition and basic forms – Components of a bridge – Classification of bridges – IRC Loading Standards and specifications – Design of Reinforced Concrete Slab Bridge decks.

UNIT – V

Design of Steel Gantry Girders – types of gantry cranes – types of load acting on gantry girder – Impact factor - forms of gantry girders – design examples.

Course Outcomes

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

- Appraise the capabilities to design the special structural elements as per Indian standard code of practice.
- Analyze of critical structural components with a level of accuracy.
- Design and detail the various bridges.

Text Books:

1.Advanced RCC by Krishnam Raju, CBS Publishers & distributors, New Delhi,2000.
2. Advanced RCC by Varghese, PHI Publications, New Delhi,2012.

References:

1.Structural Design and drawing (RCC and steel) by Krishnam Raju, Univ. Press, New Delhi,2005.
2. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi,2000.

Online resources:

1.https://nptel.ac.in/courses/105105104

SOLID WASTE MANAGEMENT
(Professional Elective – V)

IV Year II-Sem

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

- Define the terms and understand the necessity of solid waste management.
- Explain the strategies for the collection of solid waste.
- Describe the solid waste disposal methods.
- Categorize Hazardous Waste.

UNIT-I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT-II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques.

UNIT-III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing - recovery of thermal conversion products; Pyrolisis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

UNIT-IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT-V

Hazardous waste Management: – Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management.

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

- Identify the physical and chemical composition of solid wastes.
- Analyze the functional elements for solid waste management.
- Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
- Identify and design waste disposal systems.

Text Books:

1. 'Integrated Solid Waste Management, Engineering Principles and Management Issues' Tchobanoglous G, Theisen H and Vigil SA, McGraw-Hill, 2000.
2. 'Solid Waste Engineering' Vesilind PA, Worrell W and Reinhart D, Brooks/Cole Thomson Learning Inc., 2002.

Reference Books:

1. 'Environmental Engineering', Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Inc., New York, 1985.
2. 'Geotechnical Aspects of Landfill Design and Construction' Qian X, Koerner RM and Gray DH, Prentice Hall, 2002.

Online Resources:

1. http://cpheeo.gov.in/cms/manual-on-municipal-solid-waste-management-2016.php
2. https://nptel.ac.in/courses/105/103/105103205/
3. https://nptel.ac.in/courses/120/108/120108005/
4. https://nptel.ac.in/courses/105/106/105106056/

ENVIRONMENTAL IMPACT ASSESSMENT
(Professional Elective – V)

IV Year II-Sem

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

- Define and Classify Environmental Impacts and the terminology.
- Understands the environmental Impact assessment procedure.
- Explain the EIA methodology.
- List and describe environmental audits.

UNIT-I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT-II

EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT-III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or UnacceptableImpactsRequiringMitigation,MitigationPlansandRelief&Rehabilitation,Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT-IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.

Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

UNIT-V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

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

- Identify the environmental attributes to be considered for the EIA study
- Formulate objectives of the EIA studies
- Identify the methodology to prepare rapid EIA
- Write EIA reports and environmental management plans

Text Books:

1. Environmental Impact Assessment Methodologies, Anjaneyulu.YandManickam.V., B.S. Publications, Hyderabad,2007
2. Environmental Impact Assessment, Barthwal, R. R., New Age International Publishers2002.

References:

1. Environmental Impact Analysis, Jain, R.K., Urban, L.V., Stracy, G.S., Van Nostrand Reinhold Co., New York,1991.
2. Environmental Impact Assessment, Rau, J.G. and Wooten, D.C., McGraw Hill Pub. Co., New York,1996.

Online Resources :

1.https://nptel.ac.in/courses/124/107/124107160
2.https://onlinecourses.nptel.ac.in/noc22_ag10

AIR POLLUTION
(Professional Elective – V)

IV Year II-Sem

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course is to

- Understand the Air pollution Concepts.
- Identify the source of air pollution.
- Know Air pollution Control devices.
- Distinguish the Air quality monitoring devices.

UNIT-I

Air Pollution: Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution- Global effects– Ambient Air Quality and standards– Monitoring air pollution, Sampling and analysis of Pollutants in ambient air – Stack sampling.

UNIT-II

Meteorology and Air Pollution: Factors influencing air pollution , Windrose , Mixing Depths , Lapse rates and dispersion - Atmospheric stability, Plume behavior, Plume rise and dispersion, Prediction of air quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.

UNIT-III

Control of Particulate Pollutants: Properties of particulate pollution - Particle size distribution - Control mechanism - Dust removal equipment – Working principles and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP.

UNIT-IV

Control of Gaseous Pollutants: Process and equipment for the removal by chemical methods - Working principles and operation of absorption and adsorption equipment - Combustion and condensation equipment.

UNIT-V

Automobile and Indoor Pollution: Vehicular pollution – Sources and types of emission – Effect of operating conditions-Alternate fuels and emissions-Emission controls and standards, Strategies to control automobile pollution– Causes of indoor air pollution-changes in indoor air quality-control and air cleaning systems-indoor air quality.

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

- Identify sampling and analysis techniques for air quality assessment.
- Describe the plume behavior for atmospheric stability conditions.
- Apply plume dispersion modelling and assess the concentrations.
- Design air pollution controlling devices.

Text Books:

1. Air Pollution, M.N.Rao and HVN Rao, Tata McGraw Hill Publishers,2007
2. Air Pollution Control Engineering, Noel, D. N., Tata McGraw Hill Publishers,2000.

References:

1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford &I.B.H.
3. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L. Maynard publisher Academic Press.

Online Resources:

1. https://indair-neeri.res.in/

REMOTE SENSING & GIS
(Open Elective - II)

IV Year I-Sem

L	T	P	C
3	0	0	3

Course Objectives:
The objectives of the course are to :

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

UNIT – I
Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

UNIT - II
Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation.

UNIT- III:
Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing.
Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization.

UNIT – IV
Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.
Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

UNIT - V
Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.
Implementing a GIS and Applications:
Implementing a GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS.

Course Outcomes
After the completion of the course student should be able to

- Describe different concepts and terms used in Remote Sensing and its data
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- Evaluate the accuracy of Data and implementing a GIS
- Understand the applicability of RS and GIS for various applications.

Text Books:

1.Remote Sensing and GIS by BasudebBhatta , Oxford University Press, 2nd Edition, 2011.
2.Introduction to Geographic Information systems by Kang-tsung Chang, McGrawHill Education (Indian Edition), 7th Edition, 2015.
3.Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

References :

1.Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W.Kiefer, Wiley Publishers, 7th Edition, 2015.\
2.Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.
3.Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.SathiKumar, N.Madhu, Pearson Education, 1st Edition, 2007.
4.Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy,

Online Resources:

1. https://nptel.ac.in/courses/105/108/105108077/

THEORY OF ELASTICITY

IV Year . I Sem

L	T	P	C
3	0	0	3

Prerequisites: Strength of Materials I & II

Course Objectives:
To impart knowledge on the basic concepts of theory of elasticity, and solve the StructuralEngineering problems.

UNIT-I
Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium 2D& 3D - boundary conditions – Strain Displacement Relations - compatibility equations – stress tensor and strain tensor.

UNIT II
Two dimensional problems in rectangular coordinates - solution by polynomials - Saint-Venants principle - determination of displacements - bending of simple beams stress function – Simply Supported and Cantilever Beams.

UNIT III
Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions Edge Dislocation - general solution of two-dimensional problem in polar coordinates - application to Plates with Circular Holes – Rotating Disk. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section.

UNIT IV
Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface
- determination of principal stresses Stress Invariants - max shear stresses - Homogeneous deformation - principal axes of strain-rotation. General Theorems:Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibriumin terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem Strain Energy.

UNIT V
Torsion of Circular Shafts - Torsion of Straight Prismatic Bars– Saint Venants Method - torsion ofprismatic bars - bars with elliptical cross sections - membrane analogy - torsion of a bar of narrowrectangular bars - torsion of shafts, tubes , bars etc.

Course outcomes:
The learner will be able to solve problems of elasticity and plasticity and be able to apply numericalmethods to solve continuum problems.

References:

1.Theory of Elasticity by Timeshenko, McGrawhill Publications
2.Theory of Elasticity by Y.C.Fung.
3.Theory of Elasticity by Gurucharan Singh

STRUCTURAL DESIGN LABORATORY

IV Year . I Sem

L	T	P	C
0	0	2	1

Pre-Requisites: Design of RC structural of design of steel structure.

List of Experiments:

1. Design of an RC beam .
2. Design of an RC one way slab
3. Design of an RC isolated footing
4. Design of an RC combined footing
5. Design of an RC two way slab
6. Arranging of critical load case for Grouping & design of footings
7. Design of a bolted connection for moment (Type –I)
8. Design of a bolted connection for moment (Type –II)
9. Design of base plate and bolts
10. Design of welded connection
11. Design of a Cantilever Retaining Wall
12. Design of a Pile & Pile cap

Course Outcome: Student will be able to develop own spread sheets for design of various structural elements.

NUMERICAL ANALYSIS LAB

IV Year I Sem

L	T	P	C
0	0	2	1

Pre requisites: Numerical Methods

Course Objectives: To impart knowledge about using the MAT lab for solving the problems.

Syllabus Contents:

1. Introduction &Working with the MATLAB user interface

2. Exercise on Basic Mathematics(Mathematical and logical operators & Solving arithmetic equations, Matrix Operations &Trigonometric functions)**(2 weeks)**

3. Exercise on Loops , Conditional Statements& Functions**(2 weeks)**

4. Exercise on plotting graphs (Plot labeling, curve labeling and editing, 2D &3D Plots) **(2 weeks)**

5. Exercise on Differentiation& Integration Problem

6. Exercise on Differential Equations

7. Exercise on Gaussian Elimination Method

8. Exercise on Solving of Polynomial Equations (Bisection,Newton-Raphson method etc)

9. Program on Stiffness Matrix Calculations for Finite Elements (1D-Bar,beam & others) Introduction to Finite Difference Method for a beam problem.

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

- Understand the Matlab interface for numerical calculations
- Hands on practice of programme interface on elemental structural analysis

PROJECT STAGE – II

IV Year II Sem

L	T	P	C
0	0	16	8

ADVANCED STRUCTURAL ANALYSIS

IV Year II Sem

L	T	P	C
3	0	0	3

Pre requisites : Structural Analysis I & II

Course Objectives:
To impart knowledge on the analysis of indeterminate structures like continuous beams,trusses and portal frames.

UNIT I
Introduction to matrix methods of analysis - statical indeterminacy and kinematical indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations - for truss element, beam element and torsional element.
Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates.

UNIT II
Assembly of stiffness matrix from element stiffness matrix - direct stiffness method - general procedure - banded matrix - semi bandwidth - assembly by direct stiffness matrix method.

UNIT III
Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway single storey, single – bay and gables frames by flexibility method usingsystem approach.

UNIT IV
Analysis of plane truss - continuous beams with and without settlement - plane frame including sides sway, grids and gable frames by stiffness methods, single bay – two storey, two bay single – storey.

UNIT V. Special analysis procedures - static condensation and sub structuring - initial andthermal stresses.

Course Outcome:
The learner will be able to analyse different indeterminate structures using Matrix methods.

References:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Gere, CBSpublications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Matrix method of S.A by Pandit & Gupta
4. Matrix Structural Analysis by Madhu B. Kanchi.
5. Matrix Methods of Structural Analysis by J.Meek.
6. Structural Analysis by Ghali and Neyveli.
7. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt Ltd.

STRUCTURAL DYNAMICS

IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites: Structural Analysis I & II, Mathematics

Course Objectives:
To impart knowledge on the fundamental of structural dynamics and their applications.

UNIT I:
Theory of Vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion -Vectorial representation of S.H.M. –Fundamental objectives of dynamic analysis - Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principleof virtual work and Hamilton principle.

UNIT II
Single Degree of Freedom Systems: Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems –Half Power (Band-Width) Method-Harmonic excitation - Vibration Isolation – Response to support motion—Force transmitted to the foundation-Transmissibility-Dynamic magnification factor – Phase angle.
Response to General Dynamic Loading– Duhamel'sIntegral-Constant Force, Rectangular load, Triangular load, Response to Periodic loading- Fourier series expression of periodic loading- Response to Fourier series loading

UNIT III
Multi Degree of Freedom Systems : Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion -Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normalmodes - Mode superposition procedure.

UNIT IV
Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.
Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions .

UNIT V
Random Vibrations: Statistical Description of Random functions, Probability density function, Gaussian distribution, Rayleigh Distribution, correlation, Fourier transform of the random vibration process, spectral analysis, spectral density functions, response to random excitation:SDOF system.

Course Outcomes: The learner will be able to understand the equation of motion, dynamics response of single and multi degree-of freedom systems.

References:

1. Dynamics of Structures by Ray W.Clough &Joseph Penzien, Second Edition, CBSPublishers &Distributors
2. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
3. Structural Dynamics by Mario Paz and William Leigh, Fifth Edition, Springer
4. Theory of Vibrations by W.T. Thomson , Pearson
5. Fundamentals of Structural Dynamics by Roy. R. Craig, John wiley &sons

THEORY OF THIN PLATES & SHELLS

IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites : Theory of Elasticity, Structural Analysis

Course Objectives:
To impart knowledge on the behavior and design of shells and Folded plates.

UNIT I
Introduction: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation ofEquilibrium using Principle of Virtual Work, Boundary Conditions.

UNIT II
Small Deflection Theory of Thin Rectangular Plates : Assumptions – Derivation of governingdifferential equation for thin plates – Boundary conditions – simply supported plate under sinusoidal load – Navier solution – Application to different cases – Levy's solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

UNIT III
Circular Plates: Differential Equation for symmetrical bending of Laterally loaded circular Plates
– Uniformly loaded circular plates –circular plate concentrically loaded – circular plate loaded at center

UNIT IV
Shells – functional behaviour – examples – structural behaviour of shells classification of shells – Definitions – various methods of analysis of shells – merits and demerits of each method – 2D. Membrane equation.
Equations of equilibrium: Derivation of stress resultants – cylindrical shells – Flugges simulationsequations.

UNIT V
Introduction to the shells of Double curvatures: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic parabolic shapes, inverted umbrella type.
Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shell and hyperboloid of revolution cooling towers.

Course Outcomes:
The learner will be able to analyse and design the shells and folded plates.

References:

1. Theory of Plates & Shells –Stephen, P.Timoshenko, S.Woinowsky-Krieger – Tata MCGraw Hill Edition
2. Analysis and design of concrete shell roofs By G.S.Ramaswami. CBS publications.
3. Design of concrete shell roofs By Billington – Tata MC Graw Hill, New York
4. Shell Analysis By N.K.Bairagi. Khanna Publishers, New Delhi.
5. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd
6. Design of concrete shell roofs By Chaterjee. Oxford and IBH.,

DESIGN OF PRESTRESSED CONCRETE STRUCTRUES

IV Year II Sem

L	T	P	C
3	0	0	3

Pre-requisites : Reinforced Concrete Design & Structural Analysis

Course Objectives:
To impart knowledge on basics of prestressing and designing of different structural elements usingPrestressing techniques.

UNIT I:
Introduction – Prestressing Systems – Pretensioning Systems – Post-tensioning Systems – High Strength Steel and Concrete - Analysis of Prestress - Resultant Stresses at a Section – Pressure Line or Thrust Line – Concept of Load Balancing .
Losses of Prestress – Loss Due to Elastic Deformation of Concrete – Shrinkage of Concrete – Creep – Relaxation of Stress in Steel – Friction – Anchorage Slip.

UNIT II:
Deflections of Prestressed Concrete Members : Importance of Control of Deflections – Factors Influencing Deflection – Short-term Deflections of Uncracked Members – Prediction of Long-time Deflections – Deflections of Cracked Members – Requirements ofIS 1343-2012.
Ultimate Flexural Strength of Beams: Introduction, Flexural theory using first principles – Simplified Methods – Ultimate Moment of Resistance of untensioned Steel.

UNIT III:
Composite Constructions: Introduction, Advantages, Types of Composite Construction, Analysis of Composite beams- Differential shrinkage- Ultimate Flexural and shear strength of composite sections- Deflection of Composite Beams. Design of Composite sections.

UNIT IV:
Prestressed Concrete Slabs: Types Of Prestressed Concrete Floor Slabs- Design of Prestressed Concrete One Way and Two Way Slabs.
Prestressed Concrete Pipes: Circular prestressing- Types of Prestressed Concrete Pipes- Designof Prestressed Concrete Pipes.

UNIT V:
Continuous Beams: Advantage of Continuous Members – Effect of Prestressing Indeterminate Structures – Methods of Achieving Continuity – Methods of Analysis of Secondary Moments – Concordant Cable Profile – Guyon's Theorem, Redistribution of moments in acontinuous beam.
Anchorage Zone Stresses in Beams : Introduction, Stress distribution in End Block – Anchorage zone stresses –Magnel's method- Guyon's Method - Anchorage zone Reinforcement as per IS1343-2012.

Course Outcomes:
The learner will be able to understand the prestressing techniques, design the various structuralelements using Prestressing techniques.

References :

1. Prestressed concrete,krishnanraju N., Tata Mc Graw Hill,New Delhi.
2. Prestressed concrete by K.U.Muthu, PHI Learning Pvt.Ltd
3. Design of prestressed concrete structure,Lin T.Yand Burns..,Asia Publication house,1995.
4. Limit state design of prestressed concrete,Gutan Y..,Applied science publishers,1972.
5. IS:1343-2012-code of practice for Prestressed concrete

THEORY OF STRUCTURAL STABILITY

IV Year II Sem

L	T	P	C
3	0	0	3

Pre requisites : RCC Design and Analysis

Course Objectives: To impart knowledge to the student about the factors affecting the stability of the structures

UNIT – I
Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behavior.

UNIT – II
Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

UNIT – III
Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

UNIT – IV
Stability of Beams: lateral torsion buckling.
Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads.

UNIT – V
Introduction to Inelastic Buckling and Dynamic Stability.

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

- Determine stability of columns and frames.
- Determine stability of beams and plates.
- Use stability criteria and concepts for analyzing discrete and continuous systems.

Reference Books:

1. Theory of elastic stability, Timoshenko and Gere, Tata Mc Graw Hill,1981
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press Pvt. Ltd.
4. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York.

ADVANCED REINFORCED CONCRETE DESIGN

IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites : Design of Reinforced Concrete Structures.

Objectives:
To impart knowledge on the behavior and design on various reinforced concrete structural elements.

UNIT I
Limit Analysis of R.C.Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, loading pattern, Bending Moment Envelop, Application for Fixed Beams and Continuous Beams. Inelastic Analysis of Slabs, Moment Redistribution in Columns, Limit Analysis with Torsional Hinges.

UNIT II
Yield line analysis for slabs: Yield line criterion – Virtual work and equilibrium methods of analysis – For square circular, Rectangular, Triangular and Hexagonal with simple and continuous end conditions- Reinforcement details.

UNIT III
Ribbed slabs : Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.
Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears-Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip sketch showing reinforcement details.

UNIT IV
Design of Reinforced Concrete Deep Beams & Corbels: Steps of Designing Deep Beams, Design by IS 456. Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs.

UNIT V
Design of Slender Columns – Slenderness limits, Methods of Design of Slender Columns, Additional Moment Method, Procedure for Design of Slender Columns.
Design of Foundations – Types of combined footings; Design of combined beam and slab footing for two columns, Raft Foundations: Flat Slab Rafts for Framed Buildings for Design of the Beam and Slab Raft under uniform Pressure.

Outcome:
The learner will be able to design the reinforced concrete elements like continues beams, irregular slabs, flat slabs Deep beams corbels, and footings.

Reference:

1. "Reinforced Concrete Design" S. Unnikrishna Pillai & Devdas Menon; Tata Mc. Graw-HillPublishing Company Ltd. New Delhi 2010.
2. "Advanced Reinforced Concrete" P.C. Varghese Prentice Hall of INDIA Private Ltd. 2008.
3. "Design of Reinforced Concrete Structures" by N.Subramanian, Oxford University Press.
4. Reinforced Concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions,

2nd edition, 1991.

5."Design Reinforced Concrete Foundations" P.C. Varghese Prentice Hall of INDIA Private Ltd.

6.IS 456-2000 Plain and Reinforced concrete book of Practice.

7.SP 16- Design Aids for Reinforced Concrete to IS 456

8.SP 34 - Hand Book as Concrete Reinforcement and retaining

STRUCTURAL HEALTH MONITORING

IV Year II Sem

L	T	P	C
3	0	0	3

Pre requisites : Concrete Technology

Course Objectives: To understand the factors affecting the durability of the strucutres

UNIT – I

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

UNIT – II

Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT – III

Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT – IV

Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT – V

Introduction to Repairs and Rehabilitations of Structures : Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

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

- Diagnosis the distress in the structure understanding the causes and factors.
- Assess the health of structure using static field methods.
- Assess the health of structure using dynamic field tests.
- Suggest repairs and rehabilitation measures of the structure

Reference Books:

1. Structural Health Monitoring, Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006
2. Health Monitoring of Structural Materials and Components_Methods withApplications,
3. Douglas E Adams, John Wiley and Sons, 2007.
4. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
5. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, AcademicPress Inc,2007.

DESIGN OF BRIDGES

IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites: Structural Analysis I &II, Reinforced Concrete Design

Course Objectives:
To impart knowledge about different types of bridges, their analysis and design for combination ofdifferent loading condition as per codal provisions.

UNIT I.
Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces- Seismic loads- Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect- Erection Forces and effects-Width of roadway and footway-General Design Requirements.
Solid slab Bridges: Introduction-Method of Analysis and Design.

UNIT II.
RCC Girder Bridges:Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy

UNIT III
Box Culverts: - Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.

UNIT IV.
Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in prestressed concrete member-Concrete cover and spacing of pre-stressing steel- Slender beams-Composite Section-Propped-Design of Propped Composite Section-Unpropped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

UNIT V.
Sub-structure of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads for piers-Abutments- Design loads for Abutments.

Course Outcomes:
The learner will be in a position to understand and design different types of bridges.

References

1. Design of Concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.
2. Bridge Deck Behaviour by E.C.Hambly.
3. Concrete Bridge Design and Practice by V.K.Raina.
4. Essentials of Bridge Engineering by Johson Victor, Oxford & IBH
5. Design of Bridges by V.V.sastry, Dhanpat Rai & Co.