ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS

CIVIL ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2022-2023)

JNTUH UNIVERSITY COLLEGE OF ENGINEERING , SCIENCE & TECHNOLOGY
HYDERABAD
Kukatpally, Hyderabad – 500085
Andhra Pradesh, 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 and economic 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, behavioural 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
B.TECH. FOUR YEAR DEGREE COURSE

COURSE STRUCTURE & DETAILED SYLLABUS (W.E.F.2022-23)

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Matrices and Calculus	3	1	0	4
2.		Applied Physics	3	1	0	4
3.		C Programming and Data Structures	3	0	0	3
4.		Engineering Workshop	0	1	3	2.5
5.		English for Skill Enhancement	2	0	0	2
6.		Elements of Civil Engineering	0	0	2	1
7.		Applied Physics Laboratory	0	0	3	1.5
8.		English Language and Communication Skills Laboratory	0	0	2	1
9.		C Programming and Data Structures Laboratory	0	0	2	1
10.		Environmental Science	3	0	0	0
11.		Induction Programme				
		Total	**14**	**3**	**12**	**20**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Ordinary Differential Equations and Vector Calculus	3	1	0	4
2.		Engineering Chemistry	3	1	0	4
3.		Computer Aided Engineering Graphics	1	0	4	3
4.		Applied Mechanics	3	0	0	3
5.		Surveying	2	0	0	2
6.		Python Programming Laboratory	0	1	2	2
7.		Engineering Chemistry Laboratory	0	0	2	1
8.		Surveying Laboratory - I	0	0	2	1
		Total	**12**	**3**	**10**	**20**

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II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MA301BS	Probability and Statistics	3	1	0	4
2.	PC	Building Materials, Construction and Planning	3	0	0	3
3.	PC	Engineering Geology	3	0	0	3
4.	PC	Strength of Materials – I	3	1	0	3
5.	PC	Fluid Mechanics	3	0	0	3
6.	PC	Surveying Laboratory - II	0	1	2	2
7.	PC	Strength of Materials Laboratory	0	0	2	1
8.	PC	Computer Aided Drafting Laboratory	0	0	2	1
9.	*MC309	Constitution of India	3	0	0	0
		Total	**18**	**2**	**6**	**20**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	ES	Basic Electrical and Electronics Engineering	3	0	0	3
2.	PC	Concrete Technology	3	0	0	3
3.	PC	Strength of Materials – II	3	0	0	3
4.	PC	Hydraulics and Hydraulics Machinery	3	0	0	3
5.	PC	Structural Analysis - I	3	0	0	3
6.	PC	Fluid Mechanics and Hydraulics Machinery Laboratory	0	0	2	1
7.	ES	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1
8.	PC	Concrete Technology Laboratory	0	0	2	1
9.	RTRP(ES)	Real-time Research Project/ Field-Based Project	0	0	4	2
10.	*MC409	Gender Sensitization Laboratory	0	0	2	0
		Total	**15**	**0**	**12**	**20**

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III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PC	Structural Analysis - II	3	0	0	3
2.	PC	Geotechnical Engineering	3	0	0	3
3.	PC	Structural Engineering -I (RCC)	3	1	0	3
4.	SM504MS	Business Economics & Financial Analysis	3	0	0	3
5.	PC	Transportation Engineering	3	0	0	3
6.	PC	Hydrology and Water Resources Engineering	3	0	0	3
7.	PC	Transportation Engineering Laboratory	0	0	2	1
8.	PC	Geotechnical Engineering Laboratory	0	0	2	1
9.	*MC510	Intellectual Property Rights	3	0	0	0
		Total	**21**	**0**	**4**	**20**

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.	PC	Environmental Engineering	3	0	0	3
2.	PC	Foundation Engineering	3	0	0	3
3.	PC	Structural Engineering -II (Steel Structures)	3	1	0	3
4.	PE	Professional Elective – I	3	0	0	3
5.	OE	Open Elective - I	3	0	0	3
6.	PC	Environmental Engineering Laboratory	0	0	2	1
7.	PC	Computer Aided Design Laboratory	0	0	2	1
8.	EN608HS	Advanced English Communication Skills Laboratory	0	0	2	1
9.	IOMP	Industry Oriented Mini Project/ Internship	0	0	4	2
10.	*MC609	Environmental Science	3	0	0	0
		Total	**18**	**0**	**10**	**20**

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

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COURSE STRUCTURE & DETAILED SYLLABUS (W.E.F.2022-23)

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PC	Quantity Survey & Valuation	2	0	0	2
2.	HS	Project Management	2	0	0	2
3.	PE	Professional Elective – II	3	0	0	3
4.	PE	Professional Elective – III	3	0	0	3
5.	PE	Professional Elective - IV	3	0	0	3
6.	OE	Open Elective - II	3	0	0	3
7.	PC	Civil Engineering Software Laboratory	0	0	2	1
8.	PC	Project Stage - I	0	0	6	3
		Total	**16**	**0**	**8**	**20**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PE	Professional Elective – V	3	0	0	3
2.	PE	Professional Elective - VI	3	0	0	3
3.	OE	Open Elective - III	3	0	0	3
4.	PC	Project Stage – II including seminar	0	0	22	9+2
		Total	**9**	**0**	**22**	**20**

***MC – Satisfactory/Unsatisfactory**

TOTAL CREDITS - 160

Professional Elective – I
1. Green Building Technologies
2. Geomatic Applications in Civil Engineering
3. Smart Cities Planning & Management
Professional Elective – II
1.Prestressed Concrete
2.Elements of Earthquake Engineering
3.Advanced Structural Analysis
Professional Elective – III
1.Earth Retaining Structures
2.Ground Improvement Techniques
3.Stability Analysis of Slopes
Professional Elective – IV
1.Design of Hydraulic Structures
2.Advanced Water Resources Engineering
3.Ground Water Hydrology
Professional Elective – V
1.Solid Waste Management
2.Environmental Impact Assessment
3.Air Pollution
Professional Elective – VI
1.Airport, Railways, and waterways
2. Pavement Asset Management
3.Pavement Analysis & Design
Open Electives -I
1. Disaster Preparedness & Planning Management
2. Building Management System
3. Environmental Impact Assessment
Open Electives -II
1.Geographical Information systems
2.Sustainable Infrastructure Development
3.Professional Practice, Law & Ethics
Open Electives -III
1.Energy Efficient Buildings
2.Multi Criterion Decision Making
3.Environmental Pollution and Control

MATRICES AND CALCULUS

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

Pre-requisites: Mathematical Knowledge at pre-university 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.
- Geometrical approach to the mean value theorems and their application to the mathematical problems.
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative.
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications.

UNIT-I: Matrices **10 L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordanmethod, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors **10 L**

Linear Transformation and Orthogonal Transformation: Eigen values, Eigenvectors and their properties, 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 ofQuadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Calculus **10 L**

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.

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: Multivariable Calculus (Partial Differentiation and applications) **10 L**

Definitions of Limit and continuity.

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables usingmethod of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration) 8 L

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).

Course outcomes: After learning the contents of this paper the student must 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.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions.
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint,2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

APPLIED PHYSICS

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

Pre-requisites: 10 + 2 Physics

Course Objectives: The objectives of this course for the student are to:

- Understand the basic principles of quantum physics and band theory of solids.
- Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
- Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
- Study the characteristics of lasers and optical fibres.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron- origin of energy bands- classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure,materials, working principle and characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis - soft and hard magnetic materials -magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics.

Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser, CO2 laser, Argon ion Laser, Nd:YAG laser- semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection-construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber - optical fiber for communication system - applications.

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

- Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
- Identify the role of semiconductor devices in science and engineering Applications.
- Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
- Appreciate the features and applications of Nanomaterials.
- Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill,4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group Energy Materials Taylor & Francis Group, 1st Edition, 2022.

C PROGRAMMING AND DATA STRUCTURES

I Year I Sem. **L T P C**

3 0 0 3

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development.

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output.

Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

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, Recursion.

Designing Structured Programs- Functions, basics, user defined functions, inter function communication, standard functions.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays.

UNIT - III

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility, **Pointer Applications** – Passing an array to a function, Memory allocation functions, array of pointers **Strings** – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulationfunctions, string / data conversion.

UNIT - IV

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and initializationof structures, accessing structures, operations on structures, complex structures. Unions – Referencingunions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT – V

Sorting- selection sort, bubble sort, insertion sort.

Searching-linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

Course Outcomes:

- Understand the various steps in Program development.
- Explore the basic concepts in C Programming Language.
- Develop modular and readable C Programs.
- Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Data structures.
- Apply data structures such as stacks, queues in problem solving.
- To understand and analyze various searching and sorting algorithms.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.
3 Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition.
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI.
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

ENGINEERING WORKSHOP

I Year I Sem. **L T P C**
0 1 3 2.5

Pre-requisites: Practical skill.

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineeringproducts.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipmentand machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint).
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit).
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel).
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern).
V. Welding Practice – (Arc Welding & Gas Welding).
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light).
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook).

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and WoodWorking.

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

- Study and practice on machine tools and their operations.
- Practice on manufacturing of components using workshop trades including pluming,fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes includingdrilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage.
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech.
2. Workshop Manual / Venkat Reddy/ BSP.

ENGLISH FOR SKILL ENHANCEMENT

I Year I Sem. **L T P C**
2 0 0 2

Course Objectives: This course will enable the students to:

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

UNIT - I

Chapter entitled '***Toasted English*' by R.K.Narayan** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structuresand Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT - II

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture" published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

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

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT - III

Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Confused - 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 – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter ofRequisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT - V

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were notcovered in the previous units*)

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 in AICTE Model Curriculum are coveredin the syllabus of ELCS Lab Course.***

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended,*** besides following the prescribed textbook, 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 in the class.

- **Note**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

Course Outcomes: Students will be able to:

- Understand the importance of vocabulary and sentence structures.
- Choose appropriate vocabulary and sentence structures for their oral and written communication.
- Demonstrate their understanding of the rules of functional grammar.
- Develop comprehension skills from the known and unknown passages.
- Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
- Acquire basic proficiency in reading and writing modules of English.

TEXT BOOK:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language,Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students.Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

ELEMENTS OF CIVIL ENGINEERING

I Year I Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Nil

Course objectives:

- To provide practical knowledge about physical properties of minerals and rocks.
- To determine the characteristics of cement**,** Coarse & Fine aggregates.

List of Experiments:

1. **Identification of Minerals** – Silica Group, Feldspar Group, Crystalline Group, CarbonateGroup, Pyroxene Group, Mica Group, Amphibole Group.
2. **Identification of Rocks –** Igneous Petrology, Sedimentary Petrology, MetamorphicPetrology.
3. 1. Study of topographical features from Geological maps. Identification of symbols in maps.
   2. Simple structural Geology Problems (Folds, Faults & Unconformities).
4. **Tests on Cement**
   a. Fineness test & Normal Consistency test.
   b. Specific gravity test, Initial and Final setting time of cement.
5. **Tests on Fine Aggregates**
   a. Specific Gravity test.
   b. Bulking of sand & Fineness modulus of Fine aggregate.
6. **Tests on Coarse Aggregate**
   a. Specific Gravity test.
   b. Fineness modulus of Coarse aggregate.

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.
- Evaluate the properties of cement, fine and coarse aggregates and determine its suitability for construction.

TEXT BOOK:

1. IS 383 :1993 “Specification for Coarse and Fine Aggregates from Natural Sources for Concrete”.

APPLIED PHYSICS LABORATORY

I Year I Sem. **L T P C**
0 0 3 1.5

Course Objectives: The objectives of this course for the student to

- Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
- Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
- Able to measure the characteristics of dielectric constant of a given material.
- Study the behavior of B-H curve of ferromagnetic materials.
- Understanding the method of least squares fitting.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam
    b) Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

Note: *Any 8 experiments are to be performed.*

Course Outcomes: The students will be able to:

- Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
- Appreciate quantum physics in semiconductor devices and optoelectronics.
- Gain the knowledge of applications of dielectric constant.
- Understand the variation of magnetic field and behavior of hysteresis curve.
- Carried out data analysis.

REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I Year I Sem. **L T P C**
0 0 2 1

The **English Language and Communication Skills (ELCS) 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 the 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 the impact of dialects.
- To train students to use language appropriately for public speaking, group discussions 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 the 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
- Describing objects/situations/people
- Role play – Individual/Group activities

• Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – IICALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern insentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests andSeeking Permissions - Telephone Etiquette.

Exercise - IIICALL Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IVCALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion
Practice: Group Discussion

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 T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contentsof the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10^{th} Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge UniversityPress.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

Course Outcomes: Students will be able to:

- Understand the nuances of English language through audio- visual experience and group activities.
- Neutralise their accent for intelligibility.
- Speak with clarity and confidence which in turn enhances their employability skills.

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.*

CambridgeUniversity Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford UniversityPress
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* CambridgeUniversity Press

C PROGRAMMING AND DATA STRUCTURES LABORATORY

I Year I Sem. **L T P C**

0 0 2 1

Course Objectives: Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

List of Experiments:

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. Writea 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.
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)
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
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.
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 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.)
18. 18.
    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.)
19. 19.
    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 filefollowed by those of the second are put in the third file)

20. Write a C program that uses functions to perform the following operations on singly linkedlist.:
    i) Creation ii) Insertion iii) Deletion iv) Traversal

21. Write C programs that implement stack (its operations) using
    i) Arrays ii) Pointers

22. Write C programs that implement Queue (its operations) using
    i) Arrays ii) Pointers

23. Write a C program that implements the following sorting methods to sort a given list ofintegers in ascending order i) Bubble sort ii) Selection sortiii)Insertion sort

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

Course Outcomes:

- Develop modular and readable C Programs.
- Solve problems using strings, functions.
- Handle data in files.
- Implement stacks, queues using arrays, linked lists.
- To understand and analyze various searching and sorting algorithms.

TEXT BOOKS:

1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, CengageLearning.
2. Let us C, Yeswanth Kanitkar.
3. C Programming, Balaguruswamy.

ENVIRONMENTAL SCIENCE

I Year I Sem. **L T P C**
3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambientair quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards.**Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA),Low carbon life style.

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL LearningPrivate Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

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

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms.
- Solving ordinary differential equations using Laplace transforms techniques.
- 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: First Order ODE **8 L**

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order **10 L**

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 $x\,V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits

UNIT-III: Laplace transforms **10 L**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, 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). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation **10 L**

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 Irrotationalvectors.

UNIT-V: Vector Integration **10 L**

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

- 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.
- Use the Laplace transforms techniques for solving ODE's.
- 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. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

ENGINEERING CHEMISTRY

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

Course Objectives:

- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
- To imbibe the basic concepts of petroleum and its products.
- To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

UNIT - I: Water and its treatment: [8]

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation

- Determination of F^- ion by ion- selective electrode method.

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion [8]

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

UNIT - III: Polymeric materials: [8]

Definition – Classification of polymers with examples – Types of polymerization –

addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: [8]

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT - V: **Engineering Materials: [8]**

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinylamides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point,pour point, flash point and fire point.

Course Outcomes:

- Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
- The students are able to understand the basic properties of water and its usage in domesticand industrial purposes.
- They can learn the fundamentals and general properties of polymers and other engineering materials.
- They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K.Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

COMPUTER AIDED ENGINEERING GRAPHICS

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

Course Objectives:

- To develop the ability of visualization of different objects through technical drawings.
- To acquire computer drafting skill for communication of concepts, ideas in the design ofengineering products.

UNIT – I:

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics.

UNIT- II:

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes.

UNIT – III:

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids –Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views.

UNIT – IV:

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Developmentof surfaces using computer aided drafting.

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 ofIsometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

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

- Apply computer aided drafting tools to create 2D and 3D objects.
- sketch conics and different types of solids.
- Appreciate the need of Sectional views of solids and Development of surfaces of solids.
- Read and interpret engineering drawings.
- Conversion of orthographic projection into isometric view and vice versa manually and by usingcomputer aided drafting.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S.Chand and company Ltd.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

APPLIED MECHANICS

I Year II Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of this course are to

- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium.
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections.
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motionand plane motion of rigid bodies.
- Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations.

UNIT - I

Introduction to Engineering Mechanics - Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space

– Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibriumof System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.

UNIT - II

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, ladder friction

Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus.

UNIT - III

Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theoremsof moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia,Parallel Axis Theorem, Perpendicular Axis Theorem.

Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT - IV

Kinematics of Particles: Kinematics of particles – Rectilinear motion – Curvilinear motion – Projectiles.Kinetics of Particles: Kinetics of particles – Newton's Second Law – Differential equations of rectilinearand curvilinear motion – Dynamic equilibrium – Inertia force – D. Alembert's Principle applied for rectilinear and curvilinear motion.

UNIT - V

Work - Energy Principle: Equation of translation, principle of conservation of energy, work - energy principle applied to particle motion and connected systems, fixed axis rotation. **Impulse – Momentum**

Principle: Introduction, linear impulse momentum, principle of conservation of linear momentum, elasticimpact and types of impact, loss of kinetic energy, co efficient of restitution.

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

- Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.

- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatorymotion and rigid body motion.

TEXT BOOKS:

1. Shames and Rao (2006), Engineering Mechanics, Pearson Education.
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics –Statics & Dynamics.

REFERENCE BOOKS:

1. Timoshenko S.P and Young D.H., "Engineering Mechanics", McGraw Hill International Edition,1983.
2. Andrew Pytel, Jaan Kiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
3. Beer F.P& Johnston E.R Jr. Vector, "Mechanics for Engineers", TMH, 2004.
4. Hibbeler R. C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
5. Tayal A.K., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
7. Meriam. J. L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.
8. P.C Dumir et al. "Engineering Mechanics", University press.

SURVEYING

I Year II Sem.

L	T	P	C
2	0	0	2

Course Objectives: The first step in engineering practice is surveying and the soundness of any civil engineering work is dependent on the reliability and accuracy of surveying. Therefore, it is imperative that a student of engineering should have good knowledge of surveying. To impart the knowledge of surveying and latest technologies in surveying it is necessary to introduce this subject in the curriculum.

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, phasesof surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip.

UNIT - II

Levelling and Contouring Leveling- Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes

Areas - Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, 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, Gale's traverse table, Omitted measurements.

UNIT - IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves.

UNIT - V

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components

of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

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

- Calculate angles, distances and levels
- Identify data collection methods and prepare field notes.
- Understand the working principles of survey instruments.
- Estimate measurement errors and apply corrections.
- Interpret survey data and compute areas and volumes.

TEXT BOOKS:

1. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi.
2. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.
3. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System - Theory and Practice,Springer -Verlag Publishers, 2001.

REFERENCE BOOKS:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill – 2000.
2. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
3. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - LaxmiPublications (P) ltd., New Delhi.
4. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. Surveying and leveling by R. Agor Khanna Publishers 2015.

PYTHON PROGRAMMING LABORATORY

I Year II Sem.

L	T	P	C
0	1	2	2

Course Objectives:

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Note: The lab experiments will be like the following experiment examples

Week -1:

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3.
   i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Print the below triangle using for loop.5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

Week - 3:

1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindromeand False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week - 4:

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

i). Write a function called remove_duplicates that takes a list and returns a new list with only theunique elements from the original. Hint: they don't have to be in the same order.

ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add"I", "a", and the empty string.

iii). Write a python code to read dictionary values from the user. Construct a function to invert itscontent. i.e., keys should be values and values should be keys.

3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

   ii) Remove the given word in all the places in a string?

   iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Writes a recursive function that generates all binary strings of n-bit length

Week - 5:

1. i) Write a python program that defines a matrix and prints

   ii) Write a python program to perform addition of two square matrices

   iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometricalshapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

Week-6:

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

   b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

   c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

   d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiplelevels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

Week- 7

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blankspaces, lower case letters and uppercase letters.

Week - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttonsas Submit and Reset.

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

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W. Chun, Pearson
6. Introduction to Python, Kenneth A. Lambert, Cengage

ENGINEERING CHEMISTRY LABORATORY

I Year II Sem.

L	T	P	C
0	0	2	1

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

List of Experiments:

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry: Estimation of the concentration of an acid by Conductometry.

III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. pH Metry: Determination of an acid concentration using pH meter.

V. Preparations:

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

VI. Lubricants:

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

VII. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. Virtual lab experiments

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to findout the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

SURVEYING LABORATORY - I

I Year II Sem. **L T P C**
0 0 2 1

Course Objective:

- Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
- Student will be able to learn and understand various instrument used in surveying.
- Student will learn and understand how to calculate Area of plot and Ground.
- Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile.

CYCLE - I

1. Chaining of a line using chain, measurements of area by cross staff survey.
2. Measurement of distance between two points when there is an obstacle for both chaining and ranging. Compass survey
3. Traversing by compass and adjustments in included angles and measurement of area - graphical adjustments.
4. Distance between two inaccessible points by compass. Plane Table Surveying
5. Measurement & Plotting of the area by Radiation method.
6. Determination of Positions objects by Intersection Method – Plane Table Survey.
7. Traverse by Plane table Survey.

CYCLE – II

Leveling

8. Measurement of elevation of various given points.
9. Elevation difference between two given points by reciprocal leveling.
10. Longitudinal Leveling
11. Cross – section Leveling
12. Plotting of Contours by Indirect Method

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

- Student will be able to prepare Map and Plan for required site with suitable scale.
- Student will be able to prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
- Student will be able to judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
- Student will be able to judge the profile of ground by observing the available existing contour map.

PROBABILITY AND STATISTICS

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

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

Course 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 statistical inferences

UNIT - I: Probability **8 L**

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

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

UNIT - II: Expectation and discrete distributions **10 L**

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: Binomial Distribution, Poisson distribution.

UNIT - III: Continuous Distributions and sampling **10 L**

Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the NormalDistribution, 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: Estimation & Tests of Hypotheses **10 L**

Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating themean, standard error of a point estimate, prediction interval. Two sample: Estimating the differencebetween two means, Single sample: Estimating a proportion, Two samples: Estimating the differencebetween two proportions, 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: Applied Statistics **10 L**

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 concepts of one unit to the concepts in other units.

TEXT BOOKS:

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

REFERENCE BOOKS:

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 Year I Sem. **L T P C**
3 0 0 3

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 / fiber– 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: Cement Mortar, Brick masonry – types – bonds; Stonemasonry – 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: Classification of buildings ,functional Planning of buildings: Sustainability and concept of Green building, General aspects to consider for planning, bye-laws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its relationto outside environment.

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

- Understand the different construction material.
- Understand the different component parts of building and their construction practices and techniques.
- Understand the functional requirements to be considered for design and construction of building.
- Identify the factors to be considered in planning and construction of buildings.
- Plan a building based on the factors and principles of planning.

TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - LaxmiPublications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Building Construction by PC Varghese PHI.
4. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
5. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; NewAge Publications.

ENGINEERING GEOLOGY

II Year I Sem. **L T P C**

3 0 0 3

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: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, 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, Laterite, 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. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

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. Improvement of

competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

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. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Tithological, 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:

- Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice.
- The fundamentals of the engineering properties of Earth materials and fluids.
- 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 Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014.
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications.

REFERENCE BOOKS:

1. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
2. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution.
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers – P.C. Varghese PHI.

STRENGTH OF MATERIALS – I

II Year I Sem. **L T P C**
3 0 0 3

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 differenttypes 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 rectangular and 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 – IV

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 andcouple -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.

UNIT – 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).

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

- Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the 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. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. Strength of Materials by R. Subramanian, Oxford University Press

REFERENCE BOOKS:

1. Mechanics of material by R.C. Hibbeler, Prentice Hall publications
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Presss

FLUID MECHANICS

II Year I Sem. **L T P C**
3 0 0 3

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 analyses 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; Properties of fluids – Viscosity, 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, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

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 realfluid flow; One, two- and three-dimensional flows; Streamline, path line, streak line and stream tube; stream function, velocity potential function , flow net , One, two- and three-dimensional continuity equations in Cartesian coordinates applications.

Fluid Dynamics

Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. correction factors. Bernoulli's equation to real fluid flows.

UNIT - III

Flow Measurement in Pipes

Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, applicationsof Momentum equations; Forces exerted by fluid flow on pipe bend, sudden enlargement in pipes.

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. Analysis of pipe networks: Hardy Cross method and EPA NET, water hammer in pipes and control measures.

UNIT - V

Laminar & Turbulent Flow

Laminar flow through circular pipes, and fixed parallel plates.

Boundary Layer Concepts

Prandtl contribution, Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness concepts of laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Drag and Lift and types of drag, magnus effect.

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

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

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited,2015.
3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

REFERENCE BOOKS:

1. Fluid Mechanics – Frank M. White – 8th Edition – Mc Graw Hill Education.
2. *Theory and Applications of Fluid Mechanics, K.Subramanya, Tata McGraw Hill
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, SumanChakraborthy, Mc Graw Hill Education (India) Private Limited
4. Fluid Mechanics and Machinery,C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
5. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai &Co
6. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publication Pvt Ltd.

SURVEYING LABORATORY – II

II Year I Sem.

L	T	P	C
0	1	2	2

Course Objectives:

- Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, and Levelling Surveying.
- Student will be able to learn and understand about theodolite and total station in surveying.
- Student will learn and understand how to calculate Area of plot and Ground.
- Student will learn and understand about Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the ground profile using total station.

CYCLE - I

Theodolite surveying:

1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.
3. Measurement of area by theodolite traversing (Gales traverse table).
4. Determination of tachometer constants.
5. Distance between two inaccessible points using the principles of tachometer surveying.
6. Distance between two inaccessible points using the principles of trigonometric surveying

CYCLE - II

Total Station:

7. Area Measurement 8. Stake Out
9. Remote Elevation Measurement
10. Missing Line Measurement
11. Longitudinal & Cross Section Profile
12. Contouring
13. Providing a Simple Circular Curve
14. Demonstration using DGPS

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

- Prepare Map and Plan for required site with suitable scale.
- Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
- Judge which type of instrument to be used for carrying out survey for a Particular Area and estimate the area.
- Judge the profile of ground by observing the available existing contour map.

STRENGTH OF MATERIALS LABORATORY

II Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To conduct the Tension test, Compression test on various materials.
- To conduct the Shear test, Bending test on determinate beams.
- To conduct the Compression test on spring and Hardness test using various machines.
- To conduct the Torsion test, Impact test on various materials.

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 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.

Course Outcomes: After the completion of the course, students should be able to

- Determine the yield stress, ultimate tensile stress, percentage elongation of steel, compressive strength of brick and concrete
- Determine the ultimate shear stress, modulus of elasticity of steel
- Determine the stiffness of the close coiled helical spring and hardness number of mild steel, brass, copper and aluminium.
- Determine the modulus of rigidity and impact strength of steel**.**

COMPUTER AIDED DRAFTING LABORATORY

II Year I Sem. **L T P C**

0 0 2 1

Course Objectives:

- To be able to plan buildings as per NBC**.**
- To understand various types of conventional signs and brick bonds.
- To draw the plan section and elevation for doors, trusses and staircases.
- To use AutoCAD tools to draw building plans, sections and elevations from a given line diagramand specifications.
- To develop working drawings of residential buildings.

List of Experiments:

1. Planning Aspects of Building systems as per National Building Code (NBC).
2. Brick bonds: English bond & Flemish bond – Odd and Even courses.
3. Developing plan and section of dog-legged staircase.
4. Developing plan of single storied residential building.
5. Developing section and elevation of single storied residential building.
6. Developing plan of single /two storied Residential building as per Building by-laws.
7. Developing plan of public building as per building by-laws.
8. Developing section and elevation of public building.
9. Development of working drawing of building –Electrical Layout.
10. Development of working drawing of building – Plumbing Layout.

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

- Plan buildings as per NBC.
- Use different Commands of selected drafting software to draw Conventional signs and brick bonds, Plan, Section and Elevation of buildings.
- Draw section and elevation of panelled doors and trusses.
- Draw and detail the different components of Stair cases.
- Develop and draw single /two storey residential building and public building as per the buildingby-laws.
- Draw Electrical layout, Plumbing layout for residential buildings.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh – LaxmiPublications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.
3. Civil Engineering Drawing-I by N. Sreenivasulu, S. Rama Rao – Radiant Publishing House.
4. Civil Engineering Drawing-II by N. Sreenivasulu – Radiant Publishing House.

REFERENCE BOOKS:

1. Engineering Graphics by P. J. Sha - S. Chand & Co
2. Civil Engineering Drawing-I by S. Mahaboob Basha – Falcon Publishers
3. Building drawing by M. G. Shah - Tata McGraw-Hill Education
4. Structural Engineering Drawing by S. Mahaboob Basha – Falcon Publishers

CONSTITUTION OF INDIA

II Year I Sem. **L T P C**
3 0 0 0

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rightsperspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutionalrole 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 Revolutionin 1917 and its impact on the initial drafting of the Indian Constitution.

Unit - 1 History of Making of the Indian Constitution- History of Drafting Committee.
Unit - 2 Philosophy of the Indian Constitution- Preamble Salient Features
Unit - 3 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 - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powersand Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit - 5 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 Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit - 6 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:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before thearrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed theconceptualization 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

- Discuss 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.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

II Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

UNIT - I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysisof simple circuits with dc excitation.

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits , Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:

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

UNIT - III:

Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control ofDC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT - IV:

P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

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 - V:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, CommonEmitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET,Biasing FET.

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

TEXT BOOKS:

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

REFERENCE BOOKS:

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, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6thedition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

CONCRETE TECHNOLOGY

II Year II Sem. **L T P C**
3 0 0 3

Pre-Requisites: Building Materials

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

Aggregate: 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 - II

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 ofmixing water.

UNIT – III

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.

UNIT - IV

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

UNIT – V

Admixtures: Types of admixtures – mineral and chemical admixtures.

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, Nano silica and Nano Alumina 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 fiber reinforced concrete.

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford university Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, 5THEdition,New Delhi

REFERENCE BOOKS:

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.

IS Codes:

IS 383 : 2016
IS 516 : 2018 (Part -1 - 4)
IS 10262 - 2019

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 fordifferent types of loading.
- To understand the unsymmetrical bending and shear center importance for equilibrium conditions in a structural member 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 diameter, 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

Unsymmetrical Bending:

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

Shear Centre: Introduction - Shear center 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.
- To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
- Analyze strength and stability of structural members subjected to Direct, and Direct and 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.
2. Mechanics of Materials by Dr. B. C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
3. Strength of Materials by R. Subramanian, Oxford University Press.

REFERENCE BOOKS:

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

HYDRAULICS AND HYDRAULIC MACHINERY

II Year II Sem. **L T P C**
3 0 0 3

Course Objectives: The objective of the course is

- 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

Open Channel Flow – I: Introduction to Open channel flow-Comparison between open channel flow and pipe flow, 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 - II

Open Channel Flow – II: 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).

UNIT - III

Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity – Rayleigh's method and Buckingham's π 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 workdone and efficiency – Angular.

UNIT - IV

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 - V

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.
Reciprocating pumps – Working, discharge, slip indicator diagrams.

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 channelin steady state conditions.
- Apply dimensional analysis and to differentiate the model, prototype and similitude conditionsfor practical problems.
- Get the knowledge on different hydraulic machinery devices and its principles that will beutilized in hydropower development and for other practical usages.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited,2015
3. Open channel flow by V.T. Chow (McGraw Hill Book Company).

REFERENCE BOOKS:

1. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt.Ltd.).
3. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, SumanChakraborthy, Mc Graw Hill Education (India) Private Limited
4. 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

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 - Deflectionsof 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 and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular archeshaving supports at different levels.

UNIT - III

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, effectof rotation of a support.

UNIT – IV

Continuous Beams: Introduction-Continuous beams - Clapeyron's theorem of three moments-Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - eeffect 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 indeterminacies for frames

- Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway
- Shear force and bending moment diagrams and Elastic curve.

UNIT – V

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 loadlonger 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 forceand maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

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

- An ability to apply knowledge of mathematics, science, and engineering.
- Analyse the statically indeterminate bars and continuous beams.
- Draw strength behaviour of members for static and dynamic loading.
- Calculate 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.
2. Structural Analysis Vol I & II by G. S. Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt.Ltd.
3. Structural analysis T. S Thandavamoorthy, Oxford university Press

REFERENCE BOOKS:

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

HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

II Year II Sem.

L	T	P	C
0	0	2	1

Course Objectives

- To **identify** the behavior of analytical models introduced in lecture to the actual behavior of realfluid 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 Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton 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.
- **Interpre**t the results obtained in the laboratory for various experiments.
- **Discover** the practical working of Hydraulic machines- different types of Turbines, Pumps, andother 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.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

II Year II Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Basic Electrical and Electronics Engineering

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

List of experiments/demonstrations:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of aSingle-Phase Transformer
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6thedition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

CONCRETE TECHNOLOGY LABORATORY

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

Course Objectives:

- To know the various procedures to determine the characteristics of cement.
- To understand the test procedures to evaluate the characteristics of aggregates.
- To know the test procedures to find the properties of fresh concrete.
- To understand the test procedures to find mechanical properties of hardened concrete.

LIST OF EXERCISES:

1. Tests on Cement:

a) Soundness.

f) Compressive strength.

2. Tests on Aggregates:

a) Specific gravity of fine aggregate.

b) Specific gravity of coarse aggregate.

c) Bulking of fine aggregate.

d) Grading of fine aggregate

3. IS method of mix design of normal concrete as per IS : 10262

4. Tests on Fresh Concrete:

a) Slump cone test.

b) Compacting factor test.

c) Vee-Bee consistometer test.

5. Tests on Hardened Concrete:

a) Compressive & Tensile strength tests.

b) Modulus of elasticity of concrete.

c) Non-destructive testing of concrete.

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

- Perform various tests required to assess the characteristics of cement.
- Test and evaluate the properties of fine and coarse aggregates and determine its suitabilityfor construction.
- Evaluate the fresh and hardened properties of concrete.
- Design the concrete mix for required strength and test its performance characteristics.

REAL TIME RESEARCH PROJECT

	L	T	P	C
II Year II Sem.	**0**	**0**	**4**	**2**

GENDER SENSITIZATION LABORATORY

II Year II Sem. **L T P C**

0 0 2 0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions aboutsex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudestowards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Unit – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Sharethe Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.

-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu"*.

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives.Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".***

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respondto gender violence.

 ESSENTIAL READING: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

STRUCTURAL ANALYSIS – II

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

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 Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.

Cables and suspension bridges:

Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

UNIT – III

Matrix Methods -Flexibility Matrix Method: Introduction to Flexibility matrix methods of analysis ;Analysis of continuous beams including settlement of supports ; Analysis of pin-jointed determinate plane frames

UNIT – IV

Matrix Methods - Stiffness Matrix Method:: Introduction to Stiffness matrix methods of analyses using 'system approach' up-to three degree of indeterminacy– Analysis of continuous beams including settlement of supports- Analysis of pin-jointed determinate plane frames ; 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 – 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.
- **Sketch** the shear force and bending moment diagrams for indeterminate structures.
- **Formulate** the stiffness matrix and analyze the beams by matrix methods.

TEXT BOOKS:

1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt. Ltd

REFERENCE BOOKS:

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

GEOTECHNICAL ENGINEERING

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

Course Objectives: The objectives of the course are to :

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

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 – pre-consolidation 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-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.
- Understand laboratory and field compaction characteristics.
- Analyze 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 & A. S. R. Rao, 2nd Edition, New age International Publishers, 2006
2. Soil Mechanics and Foundation Engineeringby V. N. S. Murthy, CBS Publishers & Distributors/Alkem Company (S), 2011
3. Principals of Geotechnical Engineering by Braja, M. Das, Cengage Learning Publishers, 10th Edition, 2020

REFERENCE BOOKS:

1. An Introduction to Geotechnical Engineering by R. D. Holtz, W. D. Kovacs, and Thomas Sheahan, Pearson, 2nd edition (2011).
2. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).
3. Geotechnical Engineering Principles and Practices by Coduto and M. Y. Ronald, Pearson 2nd edition (2010).
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi (2017).
5. Foundation Engineering by P.C. Varghese, PHI (2005).

STRUCTURAL ENGINEERING – I (RCC)

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

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 flat isolated square, rectangular, 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.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers.

REFERENCE BOOKS:

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

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

II Year. II-SEM

L	T	P	C
3	0	0	3

Course Objective:

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

Unit- I:

Macro Economic Concepts: Economics- Micro & Macroeconomics**-**National Income Accounting **-** Methods of **Estimation-** Various **Concepts** of National **Income - Inflation** - Causes of Inflation and Measures to Control Inflation **- New** Economic Policy -Industrial **policy, Trade policy**, **and** Fiscal **policy** and its Impact on Industry- **Types** of companies**-**Features.

Unit- II:

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

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 (simple** problems).

Unit- IV:

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)**.

Unit- V:

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**(simple** problems).

Course Outcome:

To perform and **evaluate present** and future worth of **the alternate projects** and to appraise **projects** by using **traditional** and DCF Methods. To carry **out** cost benefit analysis of projects and to calculate BEP **of** different alternative projects.

Suggested Readings:

1. Henry Malcom Steinar-Engineering Economics, Principles, McGraw Hill Pub.
2. D.D.Chaturvedi, S.L.Gupta, Business Economics **-** Theory and Applications**,** International Book House Pvt.Ltd. **2013**.
3. Jain and Narang" Accounting, Kalyani Publishers.
4. Arora**,** M.N.**''** Cost Accounting, Vikas Publication.
5. S.N.Maheshwari, Financial Management, Vikas Publishing House.

TRANSPORTATION ENGINEERING

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

Course Objectives:

- This course aims at providing a comprehensive insight of various elements of Highway transportation engineering. Topics related to the highway development, characterisation of different materials needed for highway construction, structural and geometric design of highway pavements along with the challenges and possible solutions to the traffic related issues will be covered as a part of this course.

UNIT -I

Introduction: History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Highway development in India, Highway planning, Highway alignment, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.

UNIT – II

Introduction to Highway Geometric Design: Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves

UNIT - III

Basic Traffic Characteristics: Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities – on-street and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; Road Intersections: Design considerations of at-grade intersections, introduction to interchanges

UNIT - IV

Tests on Soils: CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders; Bituminous Concrete: Critical parameters controlling bituminous concrete mixture design, aggregate blending concepts viz. Rothfuch's method, trial and error procedure. Introduction to advanced concretes for road applications.

UNIT -V

Introduction to Pavement Design:Types of pavements and their typical cross sections: flexible, rigid and composite; Flexible Pavement analysis and design: Introduction to multi layered analysis, IRC 37-2012 method of flexible pavement design; Rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavement slabs, IRC 58-2015 method of rigid

pavement design; Overlay Designs: Types of overlays on flexible and rigid pavements.

Course Outcomes: At the end of this course, the students will develop:

- An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance.
- An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways.
- An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil subgrade and environmental conditions using the standards stipulated by Indian Roads Congress.
- An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines.
- An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioural patterns.

TEXT BOOKS:

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros. Revised Tenth Edition, 2014
2. KadiyaliL.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition, First Reprint; Khanna Publishers, New Delhi, 2018

Code of Provisions:

Design Codes: IRC 37-2012, IRC 58-2015, IRC 81-1997

REFERENCE BOOKS:

1. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018.
2. Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.
3. Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014
4. C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1st Edition, Universities Press, 2016
5. Garber, N.J. and Hoel, L.A. Traffic and Highway Engineering, Fourth Edition; Cengage Learning, Stamford, CT, USA, 2010
6. Parthachakroborty and Animesh Das, Principles of Transportation Engineering, PHI, 2013
7. Nicholas J Garber and Lester AHoel, Traffic and Highway Engineering, 5th Edition, Cengage Learning India Private Limited, New Delhi, 5th Indian Reprint, 2011.

HYDROLOGY AND WATER RESOURCES ENGINEERING

III Year II Sem. **L T P C**
3 0 0 3

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. Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.

UNIT - I

Introduction: Concepts of Hydrologic cycle, **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: 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:

Evaporationprocess,evaporimeters,analyticalmethodsofevaporationestimation,reservoirevaporationandmethodsfor itsreduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapo transpiration over India, actual evapo transpiration, ,interception, depressionstorage,infiltration,infiltrationcapacity,measurementofinfiltration,modellinginfiltrationcapacity,classific ationofinfiltrationcapacities,infiltrationindices.

Run off: Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis, concepts of watershed management.

UNIT - III

Hydrographs:Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - Unit Hydrograph, definition, limitations and applications and Unit hydrograph, S-hydrograph, Synthetic Unit Hydrograph.

UNIT - IV

Groundwater Hydrology: Occurrence, movement and application 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 requirements of crops – crops and crop seasons in India , cropping pattern , duty and delta; Quality of irrigation water; Soil-water relationships , root zones oil water ,infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, Micro irrigation.

UNIT - V

Canal systems : alignment of canals , canal losses , estimation of design discharge. Design of channels- rigid boundary channels , alluvial channels . canal outlets: Non-modular , semi modular and modular outlets **.** Canal outlets non-modular,semi-modular andmodularoutlets.Waterlogging:causes,effectsandremedialmeasures.Liningof canals-Typesoflining-Advantages and disadvantages.Drainageofirrigatedlands- 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.
- To **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).
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers.
3.G L Asawa, IrrigationEngineering,WileyEastern .

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. Manual on Storm Water Drainage System- 2019 , CPH EO New Delhi.

TRANSPORTATION ENGINEERING LABORATORY

III Year I Sem. **L T P C**
0 0 2 1

Pre-Requisites: Building Materials, Highway Materials

Course Objectives: The objectives of the course are to

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

I. Tests on Aggregates

1.Impact test
2.Crushing value test
3.Los Angeles Abrasion test
4. Shape test

II. Tests on Bitumen

1. Penetration and softening point
2. Ductility and Elastic recovery
3. Viscosity
4. Flash and Fire points (Demo)

III. Mix preparation (Demo)

1. Marshall's Stability sample preparation
2. Marshall's Stability sample testing

IV. Traffic Lab

1. Volume Studies at Mid blocks
2. Volume Studies at Intersections
3. Speed Studies using Spot speeds
4. Speed Studies using Moving car method
5. Parking Studies
6. Road safety Audit with respect to Geometric design (video demonstration only)

Course Outcomes: Student shall be able to

- Categorize the test on materials used for Bituminous constructions.
- Evaluate the tests performed for Bitumen and mixes.
- To prepare a laboratory report

TEXT BOOKS:

1. Highway Material Testing manual, Khanna, Justo and Veeraraghavan, Nemchand Brothers

IS CODES:

1. IS 1201 -1220 (1978) "Methods for testing tars and bituminous materials"
2. IRC SP 53 -2010 "Guidelines on use of modified bitumen"
3. MS-2 Manual for Marshalls Mix design 2002

GEOTECHNICAL 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, and 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.

REFERENCE:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International, 2002.
2. Manual of Soil Laboratory Testing, K. H., Head, CRC Press, 2006, 3rd Edition

INTELLECTUAL PROPERTY RIGHTS

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

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secret law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

ENVIRONMENTAL ENGINEERING

III Year II Sem. **L T P C**
3 0 0 3

Course Objectives: This subject provides the knowledge of water sources, water treatment, design of distribution system wastewater treatment, and safe disposal methods. The topics of characteristics of wastewater, sludge digestion are also included , basics of Air Pollution & Control.

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.
- Estimate quantities of water and wastewater and plan conveyance components.
- Design components of water and wastewater treatment plants.
- Be conversant with 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, 2014
2. Environmental Engineering by D. P. Sincero and G.ASincero, Pearson 2015.
3. Environmental Engineering, I and II by BC Punmia, Std. Publications.
4. Environmental Engineering, I and II by SK Garg, Khanna Publications.
5. Environmental Pollution and Control Engineering CS Rao,Wiley Publications

REFERENCE BOOKS:

1. Water and Waste Water Technology by Steel, Wiley
2. Wastewater engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill Publication

FOUNDATION ENGINEERING

III Year II Sem. **L T P C**
3 0 0 3

Prerequisite – Geotechnical Engineering

Course Objectives:

- To Plan and execute the Soil exploration program for civil Engineering Projects.
- To analyse the stability of slopes.
- To determine the lateral earth pressures and design retaining walls.
- To determine the Bearing capacity of Soils.
- To design pile foundation .

UNIT – I

Soil Exploration: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs 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 –Pile under lateral loading - 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
- assess the stability of slopes
- calculate 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 & A. S. R. Rao, New age International Publishers, 2016.
2. Soil Mechanics and Foundation Engineeringby V. N. S. Murthy, CBS Publishers and Distributors, 2007.

3. Bowles, J.E., (2001) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, Newyork.
4. Principals of Foundation Engineering by Braja, M. Das, Cengage Learning Publishers, 8th Edition, 2016

REFERENCE BOOKS:

1. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
2. Geotechnical Engineering by S. K.Gulhati&Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.
3. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design johnwiley& sons inc (1980)
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

STRUCTURAL ENGINEERING – II (STEEL STRUCTURES)

III Year II Sem. **L T P C**
3 0 0 3

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.

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 – 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– intermediatestiffeners – 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.

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.
3. Design of steel structures by K.S.Sairam,Pearson Educational India, 2nd Edition,2013.

REFERENCE BOOKS:

1. Design of steel structures by Edwin H.Gayrold and Charles Gayrold,Tata Mac-grawhill publishers,1972
2. Design of steel structures by L.S.JayaGopal,D.Tensing,Vikas Publishing House.

GREEN BUILDING TECHNOLOGIES (PE – I)

III Year II Sem. **L T P C**
3 0 0 3

Objectives

- To learn about the environmental Implications of building construction materials.
- To learn about suitable Industrial waste materials including Biomass materials that can be used as construction material for various Infra Projects.
- To understand Thermal characteristics and heat flow characteristics of building materials.
- To study about the non-conventional energy resources like solar energy and different case studies.
- To learn about management of water, solid and sewage.

UNIT-I
Introduction
Environmental implications of buildings energy, carbon emissions, water use, waste Disposal. Building materials: sources, methods of production and environmental Implications. Green cover and built environment.

UNIT-II
Implications of Resources
Implication of resources for Building Materials and alternative concepts.
Recycling of Industrial and Building Wastes. Biomass Resources for buildings.

UNIT-III
Comforts in Building
Comforts in Building: Thermal Comfort in Buildings-Issues; Heat Transfer Characteristics of Building Materials and Building Techniques.
Incidence of Solar Heat on Buildings.

UNIT-IV:
Energy Conservation
Utility of Solar energy is buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling.
Case studies of Solar Passive Cooled and Heated Buildings.

UNIT-V:
Green Composites for Buildings & Waste Management
Green Composites for buildings .Concepts of Green Composites. Water Utilization in Buildings.
Waste Management: Low Energy Approaches to Water Management, Management of Solid Wastes, Management of Sullage water and Sewage.

Courses Outcomes;

- Relate safety to Green Technology.
- Identify Renewable Energy systems.
- Understand the impact of continued use of non-renewable energy resources.
- Investigate renewable energy systems.
- Understand energy consumption, efficiency & waste management.

TEXT BOOKS:

1. K .S.Jagadish, B.U.Venkataramareddy and K.S.Nanjundarao. Alterative Building Materials and Technologies. New Age International, 2007.
2. Michael Bauer, Peter Mosle and Michael Schwarz " Green Building-Guide book for Sustainable Architecture " Springer, 2010.

REFERENCES :

1. Osman Attmann Green Architecture Advanced Technologies and Materials. MCGraw Hill, 2010.
2. Michael F. Ashby Materials and the Environment, Elsevier, 2009.
3. Jerry Yudelson Green building Through Integrated Design McGraw Hill, 2009.
4. Mili M.Ajumdar (Ed) Energy Efficient Building in India. Teri and Mnes, 2001/2002
5. Low Energy Cooling For Sustainable Buildings John Wiley and Sons Ltd. 2009.
6. Green My Home': 10 Steps to Lowering Energy Costs and Reducing Your Carbon Footprint by Dennis.
7. C.Brewer, ISBN:97814227798411, Publisher: Kaplan Publishing. Publications Date
8. B.Givoni Man, Climate and Architecture Elsevier, 1969.
9. T.A Markus and E.N.Morris Buildings Climate and Energy. Pitman, London Arvindkishan et al (Ed)

GEOMATIC APPLICATIONS IN CIVIL ENGINEERING (PE – I)

III Year II Sem. **L T P C**
3 0 0 3

Course Objectives:

- 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.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT- II:

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.

UNIT- III:

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization.

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.

UNIT- IV:

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. **Spatial Analysis:** Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT- V:

Applications : Landuse and landcover mapping determination of crop characteristics , ground water potential identification , pollutant mapping , snow mapping , rainfall runoff modelling , soil erosion , soil classification , water shed prioritization , solid waste collection , water supply.

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 Basudeb Bhatta, 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.

REFERENCE BOOKS:

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.

SMART CITIES PLANNING AND MANAGEMENT (PE – I)

III Year II Sem. **L T P C**
3 0 0 3

Course Objectives:
• To introduce students on smart city basic concepts, global standards and Indian context of smart cities.
• To understand smart community, smart transportation and smart buildings.
• To understand Energy demand, Green approach to meet Energy demand and their capacities.
• To identify Smart Transportation Technologies in cities and concepts towards smart city.

UNIT – I: **Introduction to Smart Urban Infrastructures and Smart Cities**: Introduction to City Planning - Understanding Smart Cities - Dimensions of Smart Cities - Global Experience of Smart Cities Smart Cities – Global Standards and Performance Benchmarks, Practice Codes -Indian scenario - India "100 Smart Cities" Policy and Mission.

UNIT – II: **Smart Cities Planning and Development**: Introduction to Smart Community - Smart community concepts: Concept of Smart Community - Smart Transportation - Smart Building and Home Device - Smart Health - Smart Government - Smart Energy and Water – Cyber Security, Safety, and Privacy - Internet of Things, Block chain, Artificial Intelligence, Alternate Reality, Virtual Reality.

UNIT – III: **Smart Urban Energy Systems** – I: Conventional vs. Smart, City components, Energy demand, Green approach to meet Energy demand, Index of Indian cities towards smartness – a statistical analysis -Meeting energy demand through direct and indirect solar resources - Efficiency of indirect solar resources and its utility, Capacity limit for the indirect solar resources - Effectiveness in responsive environment in smart city; Smart communication using green resources.

UNIT – IV: **Smart Urban Energy Systems** – II: Introduction to PV technology - PV of various scale for smart city applications - Energy efficiency - Policies of Solar PV in smart domains (RPO, REC, Carbon credit, etc.) Definition - Structure of Smart Grid - Indian Perspective - Advantage & limitation - Definition, Structure of Smart Grid- Indian Perspective Advantage & limitation.

UNIT – V: **Smart Urban Transportation Systems**: Smart Transportation Technologies - Driverless and connected vehicles - ride sharing solutions - The "improve" pathway - The "shift" pathway – Smart Roads and Pavement systems.

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

- Recognize smart city concepts and their international and national standards.
- Recognize smart community, transportation and building concepts.
- Develop and calibrate energy demand and their capacity limits.
- Predict the various smart urban transportation systems and the transition from existing city towards a smart city.

TEXT BOOKS:
1. Internet of Things in Smart Technologies for Sustainable Urban Development, G. R. Kanagachidambaresan, R. Maheswar,
2.V. Manikandan, K. Ramakrishnan, Springer, 2020 2. Society 5.0: A People-centric Super-smart Society, Hitachi-UTokyo Laboratory (HUTokyo Lab), Springer, 2020

3. The Routledge Companion to Smart Cities, Katharine S. Willis, Alessandro Aurigi, Routledge International Handbooks, 2020

REFERENCES:

1. Smart Cities in Asia: Governing Development in the Era of Hyper-Connectivity YuminJoo, Yu-Min Joo, Teck-Boon Tan, Edward Elgar Pub, 2020.
2. Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era, Yoshiki Yamagata, Perry P. J. Yang, Elsevier, 2020.
3. Smart Cities and Artificial Intelligence: Convergent Systems for Planning, Design, and Operations, Christopher Grant Kirwan, Zhiyong Fu, Elsevier.2020.

DISASTER PREPAREDNESS & PLANNING MANAGEMENT (OE - 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, disaster phenomena , events-global National & Regional.

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, Covid 2019 in India , mountain and coastal areas, ecological fragility, coping with disaster- strategies , safety norms & survival kits.

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, capacity building – concepts, assessment –structural &non structural measures , legislative support.

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 develop competencies in

- The application of Disaster Concepts to Management.
- Analyzing Relationship between Development and Disasters.
- Ability to understand Categories of Disasters.
- Realization of the responsibilities to society.

TEXT BOOKS:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, RajatPublication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.
4. Manual on Natural Disaster Management plans .
5. Disaster Management in India , Rajendra Kumar Pandey , SAGE Publications ,TEXTS.

REFERENCE BOOKS:

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 HomeAffairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSAno.214, June 2003.
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

BUILDING MANAGEMENT SYSTEMS (OE – I)

III Year II Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of the course are to

- Understand the concepts and applications of Building management systems.
- Understand the fundamentals of fire alarm, access control and security systems.
- Understand the concepts and methods of energy management in buildings.

Unit I

Introduction

Concept and application of Building Management System (BMS) and Automation, requirements and design considerations and its effect on functional efficiency of building automation system, architecture and components of BMS.

Unit II

Fire Alarm System Fundamentals: What is Fire? Fire modes, History, Components, and Principles of Operation. FAS Components: Different fire sensors, smoke detectors and their types, Fire control panels, design considerations for the FA system. Field Components, Panel Components.

Unit III

Access Control System: Access Components, Access control system Design. CCTV: Camera: Operation & types, Camera Selection Criteria, Camera Applications, DVR Based system, DVM, Network design, Storage design. Components of CCTV system like cameras, types of lenses, typical types of cables, controlling system. CCTV Applications: CCTV Applications.

Unit IV

Security Systems Fundamentals: Introduction to Security Systems, Concepts. Perimeter Intrusion: Concept, Components, Technology, Advanced Applications. Security Design: Security system design for verticals. Concept of automation in access control system for safety, Physical security system with components, RFID enabled access control with components, Computer system access control – DAC, MAC, RBAC.

Unit V

Energy Management Building Management System : ASHRAE Symbols Energy Management: Energy Savings concept & methods, Lighting control, Building Efficiency improvement, IBMS (HVAC, Fire & Security) project cycle, Project steps BMS. Verticals: Advantages & Applications of BMS.

Course Outcomes: After learning the course the students should be able to:

1.Analyze current philosophy, technology, terminology, and practices used in building automation
2. Evaluate different fire standards, FAS Components.
3. Select hardware and software for HVAC system.
4 .Evaluate energy management system.

Text Books:

1. Intelligent Building Systems by Albert Ting-Pat So, WaiLok Chan, Kluwer Academic publisher
2 HVAC Controls and Systems by Levenhagen, John I.Spethmann, Donald H., McGraw-Hill Pub.

Reference Books:

1. Smart Buildings by Jim Sinopoli, Butterworth-Heinemann imprint of Elsevier,
2. Understanding Building Automation Systems by Reinhold A. Carlson, Robert A. Di iandomenico, pub. by R.S. Means Company.
3. Design of Special Hazards and Fire Alarm Systems by Robert Gagnon, Thomson Delmar Learning;
4. Process Control- Instrument Engineers Handbook by Bela G. Liptak, Chilton book co
5. HVAC Control in the New Millennium by Hordeski, Michael F, Fairmont press.

ENVIRONMENTAL IMPACT ASSESSMENT (OE – I)

III 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 Unacceptable Impacts Requiring Mitigation ,Mitigation Plans and Relief & 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.
- Prepare EIA reports and environmental management plans.

Text Books:

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

References:

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

ENVIRONMENTAL ENGINEERING LABORATORY

III Year II Sem. **L T P C**
0 0 2 1

Course Objectives: The objectives of the course is to

- **Perform** the experiments to determine water and waste water quality.
- **Understand** the water & wastewater sampling, their quality standards.
- **Estimate** quality of water, wastewater, 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
12. Determination of Residual Chlorine
13. Total count
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 aspects of the environment.

TEXT/REFERENCE 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.
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.
4. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill Publication
8. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

COMPUTER AIDED DESIGN LABORATORY

III Year II Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: Computer Aided Civil Engineering Drawing 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
- Perform analysis.
- Interpret from the Post processing results.
- Design the structural elements and a system as per IS Codes.

ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

III Year II Sem. **L T P C**
0 0 2 1

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 globalized 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 organize 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.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) 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/* – 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 English Communication Skills (AECS) Laboratory shall have the following infrastructural

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. SUGGESTED SOFTWARE:

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

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO&BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by ArunaKoneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey& Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.

INDUSTRIAL ORIENTED MINI PROJECT / SUMMER INTERNSHIP

III Year II Sem.

L	T	P	C
0	0	4	2

ENVIRONMENTAL SCIENCE

III Year II Sem. **L T P C**
3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

UNIT - I

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

Course Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in sustainable development.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

QUANTITY SURVEY & VALUATION

IV Year I Sem. **L T P C**
2 0 0 2

Course Objectives: The subject provide process of estimations required for various work in construction. To have knowledge of using SOR &SSR for analysis of rates on various works and 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.

UNIT – II
Detailed estimation of single and multi storied building.

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

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

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

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

- Understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
- Quantify 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.

NOTE: NUMBER OF EXERCISES PROPOSED:

1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

TEXT BOOKS:

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016
4. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014

REFERENCE BOOKS:

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

PROJECT MANAGEMENT

IV Year I Sem. **L T P C**
2 0 0 2

Course Objective: The Objective of this course is to lay on important foundation to student in managing projects with a special focus on every phase such as project planning, execution, monitoring and evaluation.

UNIT-I:
Introduction: Introduction to Project management – Project Characteristics-Project Life cycle- Project Identification. Formulation and implementation. Project management in different sectors: Construction, Services Sector , Public sector and Government Projects. Systems approach to project management.

UNIT-II:
Project Planning and Appraisal: Project Planning – Project Appraisal-Feasibility study-Technical , Commercial, Economic, Financial, Management, Social Cost Benefit Analysis-Project Risk Analysis.

UNIT-III:
Project Finance: Project Cost Estimation, Project Financing-Investment Criteria. Project Evaluation Techniques - Pay Back Period ,Accounting rate of return. Net present value, Internal Rate of return, Profitability Index, Cash Flows Estimation for new and replacement projects-Cost of Capital, Risk Analysis.
.
UNIT-IV:
Project Planning and Control: Planning Steps-Scheduling- Network Diagrams. Network Analysis, Critical Path, Quality Management, Project Execution, Monitoring and control, Agile project Management, Scrum, Lean Production and project management .

UNIT-V; Organizational Behavior and Project Management: Organizational Structure and Integration, Role of Project manager, Roles in the project team, Project stakeholder engagement. Leadership in project management, participative management, team building approach. Conflict Management in Projects, Stress Management.

Course Outcome: Students will be able to understand

- Importance of Project Management.
- Project Planning, Execution and implementation.
- Significance of teams in projects.
- Project evaluation techniques.

Suggested Reading:

- Join M.Nicholas and Herman Steyn, Project Management for Engineering. Business and Technology, 5e, Routledge, 2017
- Prasanna Chandra, Projects. Planning, Analysis. Selection. Financing Implementation and review, 6e,, TATA Mc Gaw Hill 2008.
- K.Nagrajan, Project Management, New Age International publishers, 7e 2015.
- Jack Gido, Jim Clements Rose Baker. Successful Project Management. Cengage Learning , 7e 2015.
- R Pancerselvam. P.Senthil Kumar, Project Management. PHI, 2009.

PRESTRESSED CONCRETE (Professional Elective – II)

IV Year I 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 pre-tensioning 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: Pre-tensioning 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 posttensioned 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:
Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.
Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

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

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

REFERENCE BOOKS:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. RamamruthamDhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

Reference Codes: IS 1343:2016

ELEMENTS OF EARTHQUAKE ENGINEERING (Professional Elective – II)

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

Pre-Requisites: Structual Engineering –II & RC Design

Course Objectives: The objectives of the course are to

- Understand Engineering Seismology.
- Explain and discuss single degree of freedom systems subjected to free and forced vibrations.
- Acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes.
- understand importance of ductile detailing of RC structures.

UNIT - I

Engineering Seismology: Earthquake phenomenon - cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy Released-Earthquake measuring instruments seismogram -Seismoscope, Seismograph, -strong ground motions- Seismic zones of India.

Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system-Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

UNIT - II

Conceptual design: Introduction-Functional Planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel.

Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings- Seismic methods of analysis- IS code based methods for seismic design- Vertical irregularities-Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT - IV

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings-Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses-Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT - V

Ductility : Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility-Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 -Behaviour of beams, columns and joints in RC buildings during earthquakes

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

- Explain and derive fundamental equations in structural dynamics.

- Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes.
- Evaluate base shear using IS methods.
- Design and Detail the reinforcement for earthquake forces.

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Eartquake Resistant Design of Buidling structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K.International Publishing House Pvt. Ltd.
4. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand& Bros
5. Earthquake Tips – Learning Earthquake Design and Construction,C.V.R. Murthy

BIS Codes:1. IS 1893(Part-1):2016.
2. IS 13920:2016. 3. IS 4326. 4. IS 456:200

ADVANCED STRUCTURAL ANALYSIS (Professional Elective – II)

IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

- Understand the matrix method of analysis statically indeterminate frames and trusses.
- Know the transformation of coordinates and assembly of stiffness matrices.
- Differentiate between flexibility and stiffness methods of analysis of beams, frames and plane trusses.
- Understand the structural behavior of large frames with or without shear walls.

UNIT- I

Introduction to matrix methods of analysis statically indeterminacy and kinematics 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 tensional 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-bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.

UNIT- III

Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.

UNIT- IV

Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.

UNIT- V

Special analysis procedures-static condensation and sub structuring-initial and thermal stresses.

Shear Walls Necessity-structural behavior of large frames with and without shear walls-approximate methods of analysis of shear walls.

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

- Analyze the multistory building frames by various approximate methods.
- Solve the continuous beams, portal frames by matrix methods of analysis.
- Analyze and design of large frames with or without shear walls.

TEXT BOOKS:

1. Advanced Structural Analysis by A.K. Jain Nemchand Publishers.
2. Matrix methods of structural analysis by Pandit and gupta.

REFERENCE BOOKS:

1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.
2. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.
3. Matrix methods of structural analysis by J Meek
4. Structural Analysis by Ghali and Neyveli

EARTH RETAINING STRUCTURES (PE – III)

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

Course Objectives:

- To estimate earth pressure under different loads and conditions.
- To determine the stability of gravity and cantilever Retaining walls.
- To design sheet pile walls and bracings.
- To design Reinforced soil walls.

UNIT-I

Earth Pressure Theories: Rankine's and Coulomb's Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads.

UNIT-II

Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity & overall) of gravity and cantilever walls, Proportioning of retaining walls, Backfill material and drainage.

UNIT-III

Flexible Walls: Sheet pile walls, Construction methods**-** Cantilever and Anchored (Free and Fixed support methods) sheet pile walls in coarse and fine grained soils, Rowe's moment reduction method.

UNIT-IV

Braced Cuts: Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation, Diaphragm walls – slurry support.

UNIT-V

Reinforced Soil Walls/Mechanically Stabilised Earth: - Introduction to geosynthetics – Functions and applications - Failure mechanisms of Reinforced soil walls -bond and rupture failures- Internal and external stability by Static analyses -Soil Nailing.

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

- Calculate the earth pressures under different applied loads and ground conditions.
- Assess stability of conventional retaining walls.
- Design flexible retaining walls under different soil and fixity conditions.
- Design the supporting systems for excavations.
- Design geosynthetic reinforced earth walls.

TEXT BOOKS:

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey

REFERENCE:

1. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
2. Rowe, R. K. - Geotechnical &Geoenvironmental Engineering Hand Book -Springer (2001)
3. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, Van Nostrand Reinhold, 1975
4. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi.

GROUND IMPROVEMENT TECHNIQUES (PE – III)

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

Prerequisites: Geo-Technical Engineering, Foundation Engineering

Course Objectives:

- To Identify difficult ground conditions in engineering practice.
- To select suitable ground improvement techniques for problematic soils.
- To assess suitable physical, chemical, mechanical and hydraulic modifications.

UNIT- I

Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, In situ and laboratory tests to characterise problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.

UNIT- II

Mechanical Modification – Deep Compaction Techniques- Blasting Vibrocompaction, Dynamic Tamping and Compaction piles.

UNIT- III

Hydraulic Modification – Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering.Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains.

UNIT- IV

Physical and chemical modification: Stabilisation with admixtures like cement, lime, calcium chloride, fly ash and bitumen; Grouting: Categories of grouting, Art of grouting, Grout materials, Grouting techniques and control.

UNIT- V

Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

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

- Understand the various ground improvement methods.
- Assess different compaction methods for ground modification.
- Design dewatering systems to reduce the settlements.
- Comprehend stabilizations with chemical and grouting techniques.
- Understand the principles of soil reinforcement and confinement in engineering constructions.

TEXT BOOKS:

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis
3. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey

REFERENCE:

4. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
5. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.

6. K. Krisch& F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
7. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

STABILITY ANALYSIS OF SLOPES – (PE-III)

IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To know the basic concepts of slope stability.
- To identify various causes of failure of slopes.
- To analyse and design the slopes under various loading.
- To adopt slope protection methods.

UNIT-I

Earth and Rock fill Dams: General features, Selection of site; Merits and demerits of the earth and rock fill dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements, Seismic measurements.

UNIT-II

Failures, Damages and Protection of Earth Dams: Nature and importance of failure, piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters.

UNIT-III

Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non-circular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long term stability in slopes. Taylor Charts.

UNIT-IV

Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, Sliding Block Analysis, Introduction to Seismic stability, Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete).

UNIT-V

Slope Protection and Rock fill Dams: Stabilization of slopes: Soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete). Requirements of compacted rockfill, Shear strength of rockfill, Rockfill mixtures, Rockfill embankments, Earth-core Rockfill dams, Stability, Upstream & Downstream slopes.

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

- Select suitable site and materials for the construction of earth / rockfill dams.
- Analyse seepage through a given earth / rockfill dam section and propose suitable seepage control measures.
- Analyse the stability of earthen dams.
- Design the slopes by using different analytical methods.
- Implement slope protection methods.

TEXT BOOKS:

1.Engineering for Embankment Dams, B. Singh and R. S. Varshney, A.A. Balkema, 1995.
2.Embankment Dams, H.D. Sharma, Oxford and IBH Publishing Co., 1991.

REFERENCE:

1. Earth and Earth Rock Dams, J. L. Sherard, John Wiley & Sons Inc, 1963.
2. Earth and Rockfill Dams, Christian Kutzner, A.A. Balkema, 1997
3. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams, 1999.
4. Sowers, G. F. and Salley, H. I. – Earth and Rockfill Dams, Willams, R.C., and Willace, T.S. 1965.
5. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilisation methods – John Wiley & sons. (2002).
6. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.

DESIGN OF HYDRAULIC STRUCTURES (PE – IV)

IV Year I Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: Hydraulics, Hydrology &Water Resources Engineering

Course Objectives: To study various types of storage works and, diversion headwork, their components and design principles for their 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:

- Know 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.
- Know, Analyze and Design of a irrigation system components.

TEXT BOOKS:

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

REFERENCE BOOKS:

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.

ADVANCED WATER RESOURCES ENGINEERING (PE – IV)

IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Overview of Statistical applications in Hydrology.
- General Idea of Flood routing .
- Summary of various flood mitigation measures.
- Overview of climate and causes of climate change.
- Summary of Optimization models and applications.

UNIT I:

Statistics in Hydrology: Random variables, probability of hydrologic events, probability (Gumbel, Log-Pearson type-III distribution) and statistical methods for flood frequency, trend analysis for hydrologic events.

Regression Analysis: Identification of appropriate models, parameters estimation by the least square method, measures of goodness fit, uncertainty features of LS based model parameters, statistical Inferences of Regression Coefficients, confidence Interval. Multivariate linear regression and correlation.

UNIT II:

Flood Routing: Mathematics of flood routing, various methods of flood routing, Hydrologic and Hydraulic routing. -Modified Puls Method- Muskhinghum Method-flood forecasting (unit hydrograph method)

UNIT III

Flood mitigation: flood ways, channel improvement, evacuation and flood proofing, land management, flood plain management, estimating benefits of flood mitigation.

Flood plain adjustments and regulations: Results of controlling floods, alternatives to controlling floods, range of possible adjustments, practical range of choice, critical characteristics of flood hazards.

UNIT IV

Climate System- Weather and Climate- Overview of earth-atmosphere- vertical structure of atmosphere- Radiation and Temperature- Temperature variation- vertical variation in Air temperature- temperature extremes. Causes of climate change - Modeling of climate change-General circulation models (GCMs) –IPCC scenarios - IPCC Assessment Report (AR5) - Physical Science basis.

UNIT V

Optimization Techniques, Model Formulation, models, General L.P Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Model.Formulation of a LPP - revised simplex method - duality theory - dual simplex method - sensitivity analysis.Introduction and Applications of ANN, Machine and Deep Learning in water resources Engineering.

Course Outcomes

Students are expected to have gained knowledge of

- Ability to apply statistical techniques for flood frequency studies and hydrological events and Applications of Regression Models for estimation of various parameters.
- Applications of flood routing, flood forecasting techniques for real time flood studies.
- Understanding of various mitigation measures for control of floods.
- Understanding of climate change using GCM models.
- Ability to formulate optimization models and soft computing applications

TEXT BOOKS:

1. Vedula S. and. Mujumdar P.P. '*Water resources Systems'*, McGraw-Hill Publishing Company, New Delhi. 2005
2. Ven TeChow, '*Hand book of Applied Hydrology'* McGraw-Hill Book Company, New York., 1964
3. Subramanya, K. '*Hydrology for Engineers'*, Tata McGraw-Hill Publishing Company, New Delhi.(1984.
4. Raja Sekharan S. and Vijaya Laxmi Pai G. A. , '*Neural Networks, Fuzzy Logic, and Genetic Algorithm'*, Prentice-Hall of India, New Delhi. 2003

REFERENCE BOOK:

1. Snedecor, G.W., and W.G. Cochran , '*Statistical Methods'*, East West Press, NewDelhi. 1994
2. Alfredo, H.S. and Tang Wah , '*Probability Concepts in Engineering Planning and Design: Vol-I (Basic Principles),* John Wiley & Sons, New York. 1975
3. RL Wilby, SP charles, E Zoritaa, B Timbal, P WHetton, LO Mearns - *Guide lines for use of climate science from Statistical Modeling models*. 2004
4. *Physical science basis of AR 5 report of IPCC - working group I contribution to Assessment Report-* https://ipcc.ch/report/ar5/wg1/ 2013.

GROUND WATER HYDROLOGY (PE – IV)

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

Pre-Requisites: Hydraulics & Fluid Mechanics

Course objectives: The objectives of the course are:

- **To explain** the concepts of Groundwater Development and Management.
- To **demonstrate and** derive the basic equations used in Groundwater development and management and the corresponding equations.
- To know the investigations, field studies to conduct basic ground water studies.

UNIT- I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. Ground Water Movement-Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system, ground water flow contours and their applications.

UNIT- II

Analysis of Pumping Test Data-I: Steady flow ground water flow towards a well in confined and unconfined aquifers-Dupit's and Theism's equations, assumptions, formation constants, yield of an open well interface and well tests.

UNIT- III

Analysis of Pumping Test Data-II: Unsteady flow towards well-Non-Equilibrium equations, Thesis solution, Jocob and Chow's simplifications, Leak aquifers.

UNIT- IV

Surface and sub-surface Investigation: Surface methods of exploration-Electrical resistivity method and Seismic refraction methods. Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.

UNIT- V

Saline water intrusion in aquifer: Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

Course Outcomes: On successful completion of this course, students should be able to:

- **Identify** different fundamental equations and concepts as applied in the Groundwater studies.
- **Discuss** and derive differential equation governing groundwater flow in three dimensions.
- To **solve** groundwater mathematical equations and analyze pumping tests in steady and non-steady flow cases.
- **Distinguish** and understand the saline water intrusion problem in costal aquifers.

TEXT BOOKS:

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Ground water by H.M.Raghunath, Wiley Eastern Ltd.

3. Groundwater System Planning & Management, R. Willes &W.W.G. Yeh, Prentice Hall.

REFERENCE BOOKS:

1. Ground water by Bawvwr, John Wiley & Sons.
2. Applied Hydrogeology by C.W.Fetta,CBS Publishers & Distributors.
3. Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications.

GEOGRAPHICAL INFORMATION SYSTEMS(OE – 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.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT- II:

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.

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.

UNIT- III:

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.

Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT- IV:

Awareness and digitization of GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS.

UNIT- V:

Applications of GIS: GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

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.
- **U**nderstand the applicability of RS and GIS for various applications.

TEXT BOOKS

1.Remote Sensing and GIS by Basudeb Bhatta , 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,

SUSTAINABLE INFRASTRUCTURE DEVELOPMENT (OE – II)

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

Course Objectives:

- Presenting elements and components of sustainable infrastructure creation and management.
- Introducing practices of water management, greenhouse gas reduction, and greencity planning.

Unit 1:
Process of Sustainable Engineering Design: Key principle of sustainability; Integration of architecture and engineering; Design drivers for sustainable infrastructure system; implementation.

Unit 2:
Sustainable infrastructure framework: Green building rating system; Sustainable Infrastructure frameworks: Pillars of sustainability, scale-density framework, transect, built form-ecology framework.

Unit 3
Water conservation and supply: water management plans; achieving water balance; analyzing water resources; water supply strategies
Integrated water management: integrated storm water management; urban storm water treatment strategies; constraints and barriers to implementation; gray water treatment and reuse; integrating gray water into a water resources master plan; Black water management approaches.

Unit 4
Energy and greenhouse gases: reducing demand by design; Designing Sustainable power supplies; Addressing climate change and reducing carbon footprint; Policy measures for increasing energy security and efficiency; Design guidelines and Performance standards.

Unit 5
Sustainable site planning: Built systems, and Material flows: Sustainable site planning; Green streets and transportation network; working with the land, material and waste flows .

Course Outcomes:

- The students will acquire fundamentals and principles of sustainable engineering design.
- Knowledge of existing frameworks to achieve long-term sustainability.
- Methods and techniques for waste water management and greenhouse gas emission reduction.
- Knowledge on the civil engineering aspects overall green city planning.

TEXT BOOKS:
1. S. BrySarté (2010) Sustainable Infrastructure. John Wiles & Sons, Inc. ISBN 978-0-470-912
2. Sustainable Infrastructure: Sustainable Buildings – Elisabeth Green , Tristram Hope & Alan Yates.
3. Sustainable Development spiritual dimension – Krishnan Saigal

REFERENCES :
1. Dredging for sustainable infrastructure – aarninkhof ,stefan /laboyrie polite/koningsveld ,mark van – cedaiadc
2. Sustainable infrastructure: Breakthrough in Research & Practice

PROFESSIONAL PRACTICE, LAW & ETHICS (OE II)

IV Year I Sem. **L T P C**
2 0 0 2

Course Objectives:

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.
- To develop some ideas of the legal and practical aspects of their profession.

UNIT- I

Professional Practice and Ethics: Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stake holders.

UNIT – II

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT – III

Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996;UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

UNIT- IV

Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piecerate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other - Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017.

UNIT- V

Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970.

Course Outcome:

- The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
- The students will learn the rights and responsibilities as an employee, team member and a global citizen.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ravinder Kaur, Legal Aspects of Business, 4e, Cengage Learning, 2016.

REFERENCE BOOKS:

1. RERA Act, 2017.
2. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
3. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.
4. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers.

CIVIL ENGINEERING SOFTWARE LAB

B.Tech. IV Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- Analyze and design structural elements.
- Apply water resources related problems.
- Design various geometric elements using transportation software.
- Analyze slope stability and seepage determination.
- Estimate the quantities of civil engineering structures.

Student Version Softwares:

Group 1	Group 2	Group 3	Group 4	Group 5
1.STAAD 2.DESIGN BUILDER 3.MIDAS 4.ETabs	1.CIVIL 3D 2.VISSIM 3.VISSUM 4.MX Road	1.Plaxis 2.Geo Studio	1.eQuest 2.EPA SWMM 3.EPA EPZ Suite 4.EPA NET 5.QGIS 6.HECRAS	1.PRIMAVERA 2.TEKLA 3.RS & GIS

***Note:**

1.) Open/education/academic version of software is desirable.

2.) The student may choose any software one from each of the groups.

List of experiments:

1. Estimate, planning and management of any one civil engineering structure.
2. Analyze and design G+3 building.
3. Design various geometric elements and intersections for any Highway.
4. Analyze slope stability and seepage determination.
5. Analyze and design water networks, storm water, channel flow and flood determination.

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

- Understand the features and capabilities of the software.
- Apply fundamental principles in problem solving using software tools.
- Apply the software algorithm in the domain area.
- Develop solution for a range of problem of civil engineering using software tools and prepare technical report.

PROJECT STAGE – I

IV Year I Sem.

L	T	P	C
0	0	6	3

SOLID WASTE MANAGEMENT (PE – 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. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

REFERENCE BOOKS:

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

ENVIRONMENTAL IMPACT ASSESSMENT (PE – 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, Airports.

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.
- Prepare EIA reports and environmental management plans.

TEXT BOOKS:

3. Anjaneyulu.Y and Manickam.V.Environmental Impact Assessment Methodologies,B.S. Publications, Hyderabad,2007

4. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

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

AIR POLLUTION (PE – 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. M.N.Rao and HVN Rao, Air Pollution, Tata McGraw Hill Publishers
2. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers,1999.

REFERENCE BOOKS:

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.

AIRPORT, RAILWAYS, AND WATERWAYS (PE – VI)

IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of the course are to

- Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.
- Introduce component of railway tracks, train resistance, crossing, signalling, high speed tracks and Metro Rail.
- Explain the classes of harbours, features, planning and design of port facilities.

UNIT – I

Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics - Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

UNIT - II

Introduction to Railways: Role of Indian Railways in national development – Railways for Urban Transportation – LRT , Mono Rail, Metro Rail &MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Ballast,Functions, Materials,, Ballast less Tracks,Subgrade and Embankments –Functions and Materials.

UNIT – III

Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT – IV

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signalling and Interlocking - Track Circuiting - Track Maintenance.

UNIT – V

Dock & Harbour Engineering: Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

Course Outcomes: At the end of this course, the students will develop:

- An ability to design of runways and taxiways.
- An ability to design the infrastructure for large and small airports.
- An ability to design Super elevation and transition curve for railway horizontal curves.
- An ability to design various crossing sturnout and signals in Railway Projects.
- An ability plan the harbours and ports projects including the infrastructure required for new ports and harbours.

TEXT BOOKS:

1. VenkataramaiahC(2016), "Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017

REFERENCE BOOKS:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportaion Engineering by R. Srinivasa Kumar, University Press India

PAVEMENT ASSET MANAGEMENT (PE – VI)

IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of the course are to

- Understand the role of Pavement Asset Management.
- Understand the Flexible pavement failures and importance of maintenance.
- Understand the Rigid pavement failures and importance of maintenance.
- Understand pavement evaluation.
- Understand pavement performance and deterioration modeling.

Unit 1:
Introduction to Pavement Asset Management:
Introduction to road assets: Pavement structure, shoulders, road side tree plantations, street lighting, traffic signs, traffic signals, intersection elements, interchange elements; Pavement Management as a part of Road Asset Management: Evolution and Development of Pavement Management Systems (PMS), Components of PMS and their inter linkages, Project and Network level PMS.

Unit 2:
Flexible Pavement Failures and Maintenance
Flexible Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of surface defects, deformation and disintegration of flexible pavements.

Maintenance of Flexible Pavements: Periodic maintenance: periodic renewals, need and importance of periodic renewals, planning and programming of renewals, identification of stretches to be renewed, types of renewal treatments, periodicity of renewal, rectification of profile at the time of renewal; pothole filling / patching, tools and equipment for pothole / patch repairs, modern mobile mechanized pothole filling/road patching technologies, arrangements for traffic and safety measures during road maintenance, preventive maintenance: introduction, selection of preventive maintenance treatment, warrants for preventive maintenance, flexible pavement preservation tools.

Importance of maintenance: Homogeneous sections by AASHTO's cumulative difference approach, types of maintenance – Preventive maintenance, minor rehabilitation, major rehabilitation, reconstruction; planning of maintenance activities.

Unit 3: Rigid Pavement Failures and Maintenance:
Rigid Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of joint spalling, faulting, polished aggregate, shrinkage cracking, pumping, linear cracking, durability cracking;
Maintenance of Rigid Pavements: Assessing maintenance needs, methods for repairing concrete pavements, crack sealing and joint resealing, crack stitching (cross stitching), partial-depth repair, full depth repair, slab stabilization, special techniques for rehabilitation of rigid pavements, repair materials, tools and plant, planning the maintenance operations, arrangement for traffic and safety, rigid pavement preservation tools.

Unit 4: Pavement Evaluation:
Pavement Structural Condition Evaluation: Importance of structural condition evaluation of pavements, benkelman beam technique for flexible pavement evaluation, falling weight deflectometer technique for both

flexible and rigid pavements

Pavement Functional Condition Evaluation: Importance of functional condition evaluation of pavements, pavement roughness concepts; instrumentation used to assess pavement roughness, international roughness index and its importance, measurement of surface defects in both flexible and rigid pavements

Pavement Safety Condition Evaluation: Pavement texture, importance of surface friction characteristics on pavement safety, discussion on the methods of evaluation of pavement safety

Unit 5:Pavement Performance and Deterioration Modelling:

Structural condition (Distress) models, functional condition models, initiation models and progression models; Combined measures of pavement quality, discussions on condition indices and serviceability indices, pavement condition rating, introduction to pavement rating manuals by different agencies.

Course Outcomes:

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

- Understand the role of Pavement Asset Management.
- Understand the Flexible and Rigid pavement failures and importance of maintenance.
- Understand importance of pavement evaluation.
- Understand pavement performance and deterioration modeling.

Text books:

1. Ralph Haas, Ronald Hudson, Zanieswki with Lynne Cowe Falls, “Pavement Asset Management’, Wiley, 2015.
2. Shahin, M.Y., “Pavement Management for Airports, Roads and Parking Lots”, Springer, 2nd Edition, 2005

Reference Books:

1. IRC 82: 2015, First Revision, Code of Practice for maintenance of Bituminous Road Surfaces
2. IRC SP 83: 2018, First Revision, Guidelines for maintenance, repair and rehabilitation of cement concrete pavements
3. Feng Li, Jinyan Feng, Youxin Li, Siqi Zhou, Preventive Maintenance Technology for Asphalt Pavement, Springer, 2021
4. ACRP Synthesis 22, Common Airport Maintenance Practices, Transportation Research Board, Washington DC, 2011
5. R. Keith Moble, An Introduction to Predictive Maintenance, Second Edition, Butterworth Heinemann Publications, 2002
6. NCHRP 523 – “Optimal Timing of Pavement Preventive Maintenance Treatment Applications”, Transport Research Board, 2004
7. NCHRP Synthesis 501 – “Pavement Management Systems: Putting data to work – A Synthesis of Highway Practice, Transport Research Board, 2017
8. Highway Rating manuals
9. HDM 4 manuals
10. Derek Pearson, “Deterioration and Maintenance of Pavements, Ice Publishing, 2012
11. RajibBasuMallick and Tahar El-Kochi, Pavement Engineering: Principles and Practice, CRC Press 2013

PAVEMENT ANALYSIS & DESIGN (PE – VI)

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

Pre Requisites: Transportation Engineering.

Course Objectives:

- Engineering analysis of stresses and strains in typical highway pavement structures due to loading from traffic and climate.
- Characterization of paving materials; structural pavement design by IRC, and AASHTO for flexible and rigid pavement are discussed.
- Overlay design for Flexible and Rigid pavement is discussed.

UNIT – I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II

Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses In Flexible Pavements**: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts. **Stresses In Rigid Pavements**: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.

UNIT – III

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics.

UNIT - IV

Design Of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods.

Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT – V

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, Rural road designs – code of practice. **Design of Overlays**: Types of Overlays, Suitability, Design of overlays.

Course Outcomes: The student will be able to

- Understand Factors Affecting Pavement Design.
- Understand Stresses In Pavements and Material Characteristics.
- Design Flexible and Rigid Pavements.
- Design of Pavement for Low Volume Roads

Text Books:

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.

References:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes 37,58,62,81 for Flexible and Rigid Pavements design, low volume roads and over lays.

ENERGY EFFICIENT BUILDINGS (OE – III)

IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: To introduce the different concepts of sustainable design and green building techniques to achieve energy efficient buildings concepts and how they may be synthesized to best fit a specific construction project.

UNIT I:

Introduction : Life Cycle impacts of materials and products – sustainable design concepts – strategies of Design for the Environment -The sun-earth relationship and the energy balance on the earth's surface, climate, wind – Solar radiation and solar temperature – Sun shading and solar radiation on surfaces – Energy impact on the shape and orientation of buildings – Thermal properties of building materials. Studying the Nation Building Code (NBC 2005) code with respect to the Chapter 11 on Sustainability.

UNIT II :

Energy Efficient Buildings : Passive cooling and day lighting – Active solar and photovoltaic- Building energy analysis methods- Building energy simulation- Building energy efficiency standards- Lighting system design- Lighting economics and aesthetics- Impacts of lighting efficiency – Energy audit and energy targeting- Technological options for energy management.

UNIT III:

Indoor Environmental Quality Management : Psychometric- Comfort conditions- Thermal comfort- Ventilation and air quality-Air conditioning requirement- Visual perception- Illumination requirement- Auditory requirement- Energy management options- -Air conditioning systems- Energy conservation in pumps- Fans and blowers- Refrigerating machines- Heat rejection equipment- Energy efficient motors- Insulation.

UNIT IV:

Energy Conservation Building Codes: Energy Efficiency, Energy Efficient Design (Achieving Efficiency through design) Energy Conservation Building Codes (ECBC) Codes 2007 Learning Different Energy Simulation Techniques (Energy / Lighting) Advanced Energy Efficient Standards and Systems HVAC Lighting Appliances and Equipments Building Envelope Understanding and calculation of energy consumption of a House, office building.

UNIT V:

Concepts of Sustainable Building Social, Economic and Environmental aspects Different types of Indian and International Rating Systems (GRIHA, LEED, IGBC, Eco Housing, BREEAM, CASBEE, etc)

Course Outcomes:

The students completing the course will have ability to :

- Describe the concepts of sustainable design and green building techniques including energy efficiency and indoor environmental quality management.

Textbooks:

- Kibert, C. "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 2005
- Edward G Pita, "An Energy Approach- Air-conditioning Principles and Systems", Pearson Education, 2003.

References:

- Colin Porteous, "The New Eco-Architecture", Spon Press, 2002.
- Energy Conservation Building Codes: www.bee-india.nic.in
- Lever More G J, "Building Energy Management Systems", E and FN Spon, London, 2000.
- Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.
- John Littler and Randall Thomas, "Design with Energy: The Conservation and Use of Energy in Buildings", Cambridge University Press, 1984.
- Nation Building Code (NBC 2005)
- ECBC code book.

MULTI CRITERION DECISION MAKING (OE – III)

IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives : To introduce Normalization approaches , cluster analysis . Understand the role of optimization and analyze data using various techniques.

Unit 1:
Introduction to the course and role of optimization, data mining, MCDM methods in sustainable and effective decision making, Linear Programming Nonlinear Programming and other methods, Introduction to Fuzzy Logic, Membership development, Various types of membership functions.

Unit 2:
Normalization approaches: Rating method, Entropy method, Analytic Hierarchy Process, Fuzzy Analytic Hierarchy Process; MATLAB perspective; Weighting methods: Constraint method, Case study, MATLAB perspective.

Unit 3:
K-Means Cluster Analysis, Fuzzy Cluster Analysis, Artificial Neural Networks, Kohonen Neural Networks, Cluster Validation Techniques, Case Study, SPSS perspective, MATLAB perspective, Introduction to Discrete MCDM methods, Compromise Programming, Co-Operative Game Theory, TOPSIS, PROMETHEE, Weighted average, Multi Attribute Utility Theory, Analytic Hierarchy Process, Case Studies, MATLAB perspective.

Unit 4:
Role of uncertainty in decision making, Normalization techniques, Fuzzy TOPSIS, MATLAB perspective, Spearman rank correlation coefficient, Kendall rank correlation coefficient, Group decision making algorithms, SPSS perspective, MATLAB perspective, Data Envelopment Analysis (DEA): Methodology, Drawbacks and remedial measures, further topics in DEA.

Unit 5:
Taguchi methodology: Description, ranking process, Ant colony optimisation, Particle swarm optimisation, Expert systems, Web-based decision making, Geographic Information System, MATLAB perspective, Case Studies.

Course Outcomes:
The students completing the course will have ability to

- Understand role of Optimization.
- Understand Normalization approaches.
- Analyze data using various techniques.

Text Book:
1. K. Srinivasa Raju, D. Nagesh Kumar, Multicriterion Analysis in Engineering and Management, PHI Learning Private Limited, New Delhi, 2014.

Reference Books:
1. S.N. Sivanandam and S.N.Deepa, Principles of Soft Computing, Wiley, 2013.
2. Ross TJ, Fuzzy Logic with Engineering Applications, John Wiley and Sons, 2013.

ENVIRONMENTAL POLLUTION AND CONTROL (OE – III)

IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives:
• Impart knowledge on aspects of air pollution & control and noise pollution.
• Impart concepts of treatment of waste water from industrial source.
• Differentiate the solid and hazardous waste based on characterization.
• Introduce sanitation methods essential for protection of community health.
• Provide basic knowledge on sustainable development.

UNIT – I:
Air Pollution:
Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards. Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO:14000.

UNIT –II:
Industrial waste water Management:
Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT – III:
Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of Land filling. Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

UNIT – IV:
Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT – V:
Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

Course Outcomes:
At the end of the course, the students will be able to
● Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
● Identify the air pollutant control devices and have knowledge on the NAAQ standards and air emission standards.
● Differentiate the treatment techniques used for sewage and industrial wastewater treatment.
● Inventing the methods of environmental sanitation and the management of community facilities without spread of epidemics.

● Appreciate the importance of sustainable development while planning a project or executing an activity.

TEXT BOOKS

1. Peavy, H. S., Rowe, D.R, Tchobanoglous, "Environmental Engineering", G.Mc-Graw Hill International Editions, New York 1985.
2. J. G. Henry and G.W. Heinke, "Environmental Science and Engineering", Pearson Education.

REFRENCES:

1. G. L. Karia and R.A. Christian, "Waste water treatment- concepts and design approach", Prentice Hall of India
2. M. N. Rao and H. V. N. Rao, "Air pollution", Tata Mc.Graw Hill Company.
3. Ruth F. "Weiner and Robin Matthews Environmental Engineering", 4th Edition Elesevier, 2003.
4. K. V. S. G. Murali Krishna, "Air Pollution and Control" by, Kousal & Co. Publications, New Delhi.

PROJECT STAGE – II SEMINAR

IV Year II Sem.	L	T	P	C
	0	0	22	11