VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)

Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- www.uktech.ac.in)

SYLLABUS

Approved in 13th Meeting of Executive Council held on 27th March 2023 subsequent to the 14th Meeting of Academic Council held on 20th March 2023

(For admission in 2022-23 and onwards)

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SYLLABUS

For

B.TECH

(Civil Engineering)

2ND Year

Effective From – Session 2023-24

SEMESTER-III

Sl. No.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	CST 003/ AHT 006	ESC/BSC	Data Structure and Algorithms/ Advanced Applied Mathematics	3	1	0	30	20	50	100		150	4
2	AHT 007 / AHT 008	HSC	Technical Communication/Universal Human Values	2 / 3	1 / 0	0 / 0	30	20	50	100		150	3
3	CET001	DC	Construction Material	3	1	0	30	20	50	100		150	4
4	CET002	DC	Surveying	3	1	0	30	20	50	100		150	4
5	CET003	DC	Strength of material	3	1	0	30	20	50	100		150	4
6	CEP001	DLC	Construction Material	0	0	2		25	25		25	50	1
7	CEP002	DLC	Surveying	0	0	2		25	25		25	50	1
8	CEP003	DLC	Strength of material	1	0	2		25	25		25	50	1
9	CEP 004	DLC	Internship-I/Mini Project-I*	0	0	2			50			50	1
10	CST006/ CST 005	MC	Cyber Security / Python Programming	2	0	0	15	10	25	50			
11	GP 003	NC	General Proficiency						50				
			Total									**950**	**23**
12	*		**Open Elective (Optional/Minor) For other Branch**	3	1	0	30	20	50	50			**4**

*The Mini Project-I or Internship-I (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester

MOOCs course

SEMESTER-IV

Sl.No.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	AHT 008 / AHT 007	HSC	Universal Human Values /Technical Communication	3 / 2	0 / 1	0 / 0	30	20	50	100		150	3
2	AHT 006/ CST003	BSC/ESC	Advanced Applied Maths/ Data Structure and Algorithms	3	1	0	30	20	50	100		150	4
3	CET004	DC	Basic structural Analysis	3	1	0	30	20	50	100		150	4
4	CET005	DC	Concrete Technology	3	1	0	30	20	50	100		150	4
5	CET006	DC	Fluid Mechanics	3	1	0	30	20	50	100		150	4
6	CEP005	DLC	Basic structural Analysis	0	0	2		25	25		25	50	1
7	CEP006	DLC	Concrete Technology	0	0	2		25	25		25	50	1
8	CEP007	DLC	Fluid Mechanics	0	0	2		25	25		25	50	1
9	CST 005/ CST 006	MC	Python Programming / Cyber Security	2	0	0	15	10	25	50			
10	GP 004	NC	General Proficiency						50				
			Total									**900**	**22**
11	*		**Open Elective (Optional/Minor) For other Branch**	3	1	0	30	20	50	50			**4**
12	CEP008	DLC	Internship-II/Mini Project-II*	To be completed at the end of fourth semester (during Summer									

MOOCs course

*Detail in Annexures

Data Structures and Algorithms (CST-003)

L:T:P:: 3:1:0 **Credits-04**

Course Objectives: The objective of this course is to:

1. Introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem-solving.
2. Analyze step by step and develop algorithms to solve real-world problems.
3. Implement various data structures, viz. Stacks, Queues, Linked Lists, Trees and Graphs.
4. Understand various searching & sorting techniques.

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

1. Compare functions using asymptotic analysis and describe the relative merits of worst-case, average-case, and best-case analysis.
2. Become familiar with a variety of sorting algorithms and their performance characteristics (e.g., running time, stability, space usage) and be able to choose the best one under a variety of requirements.
3. Understand and identify the performance characteristics of fundamental algorithms and data structures and be able to trace their operations for problems such as sorting, searching, selection, operations on numbers, and graphs.
4. Solve real-world problems using arrays, stacks, queues, and linked lists.
5. Become familiar with the major graph algorithms and their analyses. Employ graphs to model engineering problems when appropriate.

Unit 1-Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade-off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2-Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queues: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

Unit 3-Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from the linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and complexity analysis.

Unit 4-Trees and Graphs: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Graphs: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Unit 5-Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods,

Hashing: Symbol table, Hashing Functions, Collision-Resolution Techniques

TEXTBOOKS:

1. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.
2. Ritika Mehra, Data Structures Using C, Pearson Education.
3. Data Structures using C & C++ -By Ten Baum Publisher – Prentice-Hall International.

REFERENCE BOOKS:

1. Schaum's Outlines Data structure Seymour Lipschutz Tata McGraw Hill 2nd Edition.
2. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
3. Fundamentals of Data Structures in C++-By Sartaj Sahani.
4. Data Structures: A Pseudo-code approach with C -By Gilberg&Forouzan Publisher-Thomson Learning.

Syllabus
Advanced Applied Mathematics (AHT-006)

L:T:P:: 3:1:0 **Credits-4**

Course Objectives:

The students will learn:

1. The idea of Laplace transform of functions and their applications.
2. The idea of Fourier transform of functions and their applications.
3. To evaluate roots of algebraic and transcendental equations.
4. Interpolation, numerical differentiation& integration and the solution of differential equations.
5. Acquaintance with statistical analysis and techniques.

Course Outcome(s):

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

1. Remember the concept of Laplace transform and apply in solving real life problems.
2. Apply the concept of Fourier transform to evaluate engineering problems.
3. Understand to evaluate roots of algebraic and transcendental equations.
4. Solve the problem related interpolation, differentiation, integration and the solution of differential equations.
5. Understand the concept of correlation, regression, moments, skewness and kurtosis and curve fitting.

Course Contents:

Module 1: Laplace Transform: **(8 hours)**

Definition of Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve linear differential equations.

Module 2: Fourier Transforms: **(8 hours)**

Fourier integral, Fourier sine and cosine integral, Complex form of Fourier integral, Fourier transform,Inverse Fouriertransforms, Convolution theorem, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations.

Module 3: Solution of Algebraic & Transcendental equations and Interpolation: **(8 hours)**

Number and their accuracy, Solution of algebraic and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regula-Falsi method. Rate of convergence of these methods (without proof), Interpolation: Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formula, Interpolation with unequal intervals: Newton's divided difference and Lagrange's formula.

Module 4: Numerical differentiation & Integration and Solution of ODE: **(8 hours)**

Numerical Differentiation, Numerical integration: Trapezoidal rule, Simpson's 1/3rd and 3/8 rule,Runge-Kutta method of fourth order for solving first order linear differential equations, Milne's predicator-corrector method.

Module 5: Statistical Techniques: **(8 hours)**

Introduction: Measures of central tendency, Moments, Skewness, Kurtosis, Curve fitting: Method of least squares, Fitting of straight lines, Fitting of second degree parabola, Exponential curves. Correlation and rank correlation, Regression analysis: Regression lines of y on x and x on y, Regression coefficients, Properties of regressions coefficients and non-linear regression.

Reference Books:

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons,10th ed.
2. B.V. Ramana: Higher Engineering Mathematics,McGrawHill.
3. Peter V.O'Neil: Advanced Engineering Mathematics, Cengage Learning,7th ed.
4. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th ed.
5. T.Veerarajan: Engineering Mathematics (for semester III), McGrawHill, 3rd ed.
6. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics,Narosa PublishingHouse,Std. ed.
7. P. Kandasamy, K. Thilagavathy, K. Gunavathi: Numerical Methods, S. Chand.
8. S.S. Sastry: Introductory methods of numerical analysis, Prentice Hall India, 5thed.
9. N.P. Bali and Manish Goyal: Computer Based Numerical and Statistical Techniques,Laxmi Publications, 5th ed.
10. J.N. Kapur: Mathematical Statistics, S. Chand &Company.
11. D.N.Elhance,V. Elhance&B.M. Aggarwal: Fundamentals of Statistics,Kitab Mahal.

Syllabus
Technical Communication (AHT-007)

L:T:P:: 2:1:0 **Credits-3**

COURSE OBJECTIVES:

Students should be able to:

1. To produce technical documents that use tools commonly employed by engineering and computer science professionals.
2. To communicate effectively in a professional context, using appropriate rhetorical approaches for technical documents, adhering to required templates, and complying with constraints on document format.
3. To clarify the nuances of phonetics, intonation and pronunciation skills.
4. To get familiarized with English vocabulary and language proficiency.

COURSE OUTCOMES:

1. Students will be enabled to **understand** the nature and objective of Technical Communication relevant for the work place as Engineers.
2. Students will **utilize** the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
3. Students would imbibe inputs by presentation skills to **enhance** confidence in face of diverse audience.
4. Technical communication skills will **create** a vast know-how of the application of the learning to promote their technical competence.
5. It would enable them to **evaluate** their efficacy as fluent & efficient communicators by learning the voice-dynamics.

COURSE CONTENTS:

Unit -1 Fundamentals of Technical Communication:

Technical Communication: Introduction, Features; Distinction between General and Technical Communication; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication, Importance of communication

Unit - II Forms of Technical Communication:

Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration.

Unit - III Technical Presentation: Strategies & Techniques

Presentation: Forms; interpersonal Communication; Class Room presentation; style;method, Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear: Confident speaking; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections

Unit - IV Technical Communication Skills

Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus;

Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances, exposition, narration and description

Unit - V Kinesics & Voice Dynamics:

Kinesics: Definitions; importance; Features of Body Language; Voice Modulation: Quality, Pitch; Rhythm; intonation, pronunciation, articulation, vowel and consonants sounds

Reference Books

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
3. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.
4. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.
5. A Text Book of Scientific and Technical Writing by S.D. Sharma; Vikas Publication, Delhi.
6. Skills for Effective Business Communication by Michael Murphy, Harward University, U.S.
7. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

UNIVERSAL HUMAN VALUES (AHT-008)

L:T:P:: 3:0:0 **Credits-3**

Course objectives : The objective of the course is fourfold:

1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)

2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

3. They would have better critical ability.

4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to- day settings in real life, at least a beginning would be made in this direction.

COURSE TOPICS: The course has 28 lectures and 14 practice sessions in 5 modules:

Module 1: Introduction - Value Education
Universal human values; self-exploration, natural acceptance an experimental validation; Human aspirations, right understanding, relationship and physical facility, current scenario; Understanding and living in harmony at various levels.

Module 2: Harmony in the Human Being
Understanding human being, needs of self(I) and body; body as an instrument of 'I'; characteristics and activities of 'I' and harmony in 'I'; harmony of I with the Body: Sanyam and Health, Physical needs and prosperity; Programs to ensure Sanyam and Health.

Module 3: Harmony in the Family and Society
Values in human-human relationship; nine universal values in relationships; justice, truth, respect, trust; Difference between intention and competence; Respect and differentiation, Harmony in society: resolution, prosperity, fearlessness and coexistence; Universal harmonious order in society.

Module 4: Harmony in the Nature and Existence
Harmony in the nature. Four orders of nature; existence as co-existence, harmony at all levels of existence.

Module 5: Harmony in the Professional Ethics

Natural acceptance of human values**,** Definitiveness of Ethical Human Conduct**;** Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Case studies; transition from the present state to Universal Human Order: at individual level and societal level.

READINGS: Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karam chand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Construction Materials (CET001)

3L:1T:0P **4 credits**

COURSE OBJECTIVE:

- To introduce students to various materials commonly used in civil engineering construction and their properties.

EXPECTED OUTCOMES:

On completion of this course the students will be able to

- Compare the properties of most common and advanced building materials.
- understand the typical and potential applications of these materials
- understand the relationship between material properties and structural form
- understand the importance of experimental verification of material properties

Detailed Syllabus:

Unit I: STONES – BRICKS – CONCRETE BLOCKS (8 Hours)

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks.

Unit II: LIME – CEMENT – AGGREGATES – MORTAR (8 Hours)

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading- sand bulking

Unit III: CONCRETE (8 Hours)

Concrete – Ingredients – Manufacturing Process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction Factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete – Other types of Concrete – Durability of Concrete.

Unit IV: TIMBER AND OTHER MATERIALS (8 Hours)

Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocol – Panels of laminates– Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumens.

Unit V: NEW MATERIALS (8 Hours)

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products –Refractories Composite materials – Types – Applications of laminar composites – Fibre textiles– Geomembranes and Geotextiles for earth reinforcement.

TEXT/REFERENCE BOOKS:

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2008.
4. Gambhir.M.L., "Concrete Technology", 3 rd Edition, Tata McGraw Hill Education, 2004
5. Duggal.S.K., "Building Materials", 4 th Edition, New Age International , 2008.
6. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
7. Gambhir. M.L., &NehaJamwal., "Building Materials, products, properties and systems", TMH.

Surveying (CET002)

3L:1T:0P **4 credits**

Course Objectives

With the successful completion of the course, the student should have the capability to:

1. Describe the function of surveying in civil engineering construction,
2. Work with survey observations, and perform calculations,
3. Customary units of measure. Identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision as it relates to distance, differential leveling and angular measurements.
4. Be familiar with the principals of recording accurate, orderly, complete, and logical field notes from surveying operations, whether recorded manually or with automatic data collection methods,
5. Identify and calculate the errors in measurements and to develop corrected values for differential level circuits, horizontal distances and angles for open or closed-loop traverses,
6. Operate an automatic level to perform differential and profile leveling; properly record notes; mathematically reduce and check levelling measurements,
7. Measure horizontal, vertical, and zenith angles with a transit, theodolite, total station.
8. Operate a total station to measure distance, angles, and to calculate differences in elevation.
9. Work as a team member on a surveying party to achieve a common goal of accurate and timely project completion,
10. Calculate, design and layout horizontal and vertical curves, Understand, interpret, and prepare plan, profile, and cross-section drawings, Work with cross-sections and topographic maps to calculate areas, volumes, and earthwork quantities.

Course outcomes

1. Learn chain survey, compass survey, theodolite survey , leveling, error calculation & adjustment and curve fitting
2. Use latest instruments like Digital Theodolite, Auto Level, EDM, Total station

UNIT 1: (8 Hours)

Introduction to Surveying: *Definition, Classification,* Principles, Linear, angular and graphical methods, Instruments for chaining, Ranging out survey lines, error due to incorrect chain, Survey stations, Survey lines; **Compass Surveying:** Types of Compass**,** Bearing and designation of survey lines, fore and back Bearing, calculation of angles from bearings, Local Attraction; **Plane table surveying**: Instruments, methods of plane tabling,; C**ontouring:** Characteristics, methods, uses; areas and volumes.

UNIT 2: (8 Hours)

Levelling: Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; **Theodolite Survey**: Instruments, Definitions and technical terms, Temporary adjustments, Measurement of horizontal and vertical angle; **Triangulation**: Classification, Triangulation figures, Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to centre - Intervisibility of height and distances.

UNIT 3: **(8 Hours)**

Curves: Elements of simple and compound curves – Method of setting out–Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve -Vertical curves.

UNIT 4: **(8 Hours)**

***Modern Field Survey Systems*:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station-Accessories-Advantages and Applications Field Procedure for total station survey, Errors in Total Station Survey.

UNIT 5: **(8 Hours)**

Errors - Treatment of random errors, Normal law of errors, Most Probable Value, Weight of observations, Propagation of errors and variances, Principle of Least Squares Observations and correlative Normal Equations, Adjustment of triangulation figures.

Reference Books:

1. S K Duggal : Surveying Vol 1 & 2 , TMH
2. Surveying, 5th Edition, Mc Cormac, Wiley India
3. R Subramanian : Surveying & Leveling , Oxford University Press
4. B C Punamia : Surveying & Leveling
5. C Venkatramaih : Text Book of Surveying , University Press
6. H . Kanitkar : Surveying & Levelling
7. Arora, K.R., ―Surveying‖, Vol. I & II, Standard Book House, Delhi

Strength of Materials (CET003)

3L:1T:0P **4 credits**

COURSE OBJECTIVE:

1. This subject is useful for a detailed study of forces and their effects.
2. To study the rigid and deformable solids.
3. To give an ability to calculate stresses and deformations of objects under external forces.
4. To give an ability to apply the knowledge of strength of materials on engineering applications and design problems

COURSE **OUTCOMES:**

1. Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components;

2. Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods;

3. Analyze various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress; locate the shear centre of thin wall beams;

4. Calculate the deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections of beams under unsymmetrical loading; apply various failure criteria for general stress states at points; solve torsion problems in bars and thin walled members;

Detailed Content

UNIT 1: **(8 Hours)**

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 – Elastic modules and the relationship between them –Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience– Gradual, sudden, impact and shock loadings – simple applications

Compound Stresses and Strains- Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two-dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain, relationships between elastic constants.

UNIT 2: **(8 Hours)**

Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without

overhangs. Calculation of maximum BM and SF and the point of contra-flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

UNIT 3: **(8 Hours)**

Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections

UNIT 4: **(8 Hours)**

Slope and Deflection Of Beams- Relationship between moment, slope and deflection, Double Integration Method, Moment area method, Macaulay's method, Use of these methods to calculate slope and deflection for determinant beams.

UNIT 5: **(8 Hours)**

Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close coiled helical springs.

Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

TEXT/REFERENCE BOOKS:

1. S S Rattan, ―Strength of Materials‖, McGraw Hill Education.
2. M L Gambhir, ―Fundamentals of Solid Mechanics‖, Prentice Hall India Learning Private Limited.
3. James M. Gere, Barry J. Goodno, ―Mechanics of Materials‖, 8th edition, Cenage Learning.
4. Timoshenko, S. and Young, D. H., ―Elements of Strength of Materials‖, DVNC, NewYork,USA.
5. Kazmi, S. M. A., ―Solid Mechanics‖ TMH, Delhi, India.
6. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: PearsonPrentice Hall, 2004
7. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics ofSolids. 2nd ed. New York, NY: McGraw Hill, 1979
8. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf– TMH 2002.
9. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

Construction Materials Lab (CEP001)

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

Course Objectives:
To introduce the hands-on descriptions of various physical concepts of Building stones , Bricks, Cement and Timber.

Course Outcomes:
1. Students will be able to understand characteristics of various types of building stone.
2. Students will be able to understand various types of properties of Bricks.
3. Students will be able to understand various types of properties of cement.
4. Students will be able to understand characteristics of various types of Timber.

LIST OF PRACTICALS:

1. To identify the stones used in building works by visual examination.
2. Shape and size test of brick
3. Determination of water absorption of brick
4. Determination of compressive strength of brick
5. Determination of fineness of cement by dry sieving/ by air permeability method
6. Determination of normal consistency of cement
7. Determination of initial and final setting time of cement
8. Determination of soundness of cement
9. To identify various types of timbers such as: Teak, Sal, Chir, Sissoo, Deodar, Kail & Hollock by visual examination only

Surveying Lab (CEP002)

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

COURSE OBJECTIVES

The objective of surveying laboratory is to make student familiar and competent enough to draw map in suitable scale by using different surveying instruments like total station, theodolite, auto level, electromagnetic distance measurement (EDM), plane table, compass, etc. Surveying labs provide students with hands-on experience using advanced surveying equipment.

COURSE OUTCOMES:

At the end of the course:

1. The student will be able to develop methods through the knowledge of modern science, technology and the equipment's and use them in the field.
2. The student will be able to determine the distance and angle between different objects.
3. The student will be able to determine the relative position of any objects or points of the earth.
4. The student will be able to prepare a map or plan to represent an area on a horizontal plan.
5. The student will be able to solve measurement problems in an optimal way.
6. The student will be able to set out curves.

LIST OF PRACTICALS:

1. To learnt the technique of unfolding and folding of a metric chain and measure the distance between two points on a level ground by ranging.
2. Plane tabling by the method of radiation and intersection.
3. To measure the horizontal angle by the method of reiteration and repetition.
4. Determination of elevation of top of tower/electric pole using Theodolite.
5. Taking levels of various points, booking in a level field book and find out R.L of different points by Height of Instrument/Rise and Fall method.
6. Setting out of a simple circular curve on field (by one theodolite/ by two theodolite/by successive bisection of arcs method).
7. To prepare the contour map of an area.
8. Total Station.

Strength of Material Lab (CEP003)

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

COURSE OBJECTIVES:

The objective of the strength of materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the students through a series of experiments. The experiments are performed to measure the properties of the materials such as impact strength, tensile strength, compressive strength, hardness, ductility etc.

COURSE OUTCOMES:

At the end of the course:

1. The student will be able to understand the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. The student will be able to evaluate the values of yield stress, breaking stress and ultimate stress of the given specimen under tension test.
3. The student will be able to conduct the torsion test to determine the modulus of rigidity of given specimen.
4. The student will be able to conduct Compression test, impact test, shear test, bending test etc.

LIST OF PRACTICALS:

1. Tension test
2. Bending tests on simply supported beam and Cantilever beam.
3. Compression test on concrete
4. Impact test
5. Shear test
6. Investigation of Hook's law that is the proportional relation between force and stretching in elastic deformation,
7. Determination of torsion and deflection
8. Measurement of strain in a bar
9. Bend test steel bar;

Python Programming (CST-005)

L:T:P:: 2:0:0 **Credits-0**

Course Objectives: The objectives of this course is to:

1. Introduce the basic principles and concepts of python programming, and how python programming concepts are useful in problem-solving.
2. Write clear and effective python code.
3. To perform file operations to read and write data in files.
4. To create applications using Python Programming.

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

1. Develop essential programming skills in computer programming concepts like data types.
2. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
3. Illustrate the process of structuring the data using lists, tuples, and dictionaries.
4. Demonstrate using built-in functions and operations to navigate the file system.
5. Interpret the concepts of modules and user-defined functions in Python.

Syllabus:

UNIT – I: Introduction and Syntax of Python Program: Features of Python, Interactive, Object-oriented, Interpreted, platform-independent, Python building blocks -Identifiers, Keywords, Indention, Variables, Comments, Python environment setup – Installation and working of IDE, Running Simple Python scripts to display a welcome message, Python variables.
Python Data Types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of datatypes, Built-in Functions.

UNIT – II: Python Operators and Control Flow statements: Basic Operators: Arithmetic, Comparison/ Relational, Assignment, Logical, Bitwise, Membership, Identity operators, Python Operator Precedence.
Control Flow: Conditional Statements (if, if...else, nested if), Looping in python (while loop, for loop, nested loops), loop manipulation using continue, pass, break, else.

UNIT – III: **Data Structures in Python: String:** Concept, escape characters, String special operations, String formatting operator, Single quotes, Double quotes, Triple quotes, Raw String, Unicode strings, Built-in String methods.
Lists: Defining lists, accessing values in lists, deleting values in lists, updating lists, Basic List Operations, and Built-in List functions.
Tuples: Accessing values in Tuples, deleting values in Tuples, and updating Tuples, Basic Tuple operations, and Built-in Tuple functions.
Sets: Accessing values in Set, deleting values in Set, and updating Sets, Basic Set operations, Built-in Set functions.
Dictionaries: Accessing values in Dictionary, deleting values in Dictionary, and updating Dictionary, Basic Dictionary operations, Built-in Dictionaries functions.

UNIT – IV: Python Functions, modules, and Packages: Use of Python built-in functions (e.g., type/data conversion functions, math functions etc.).

User-defined functions: Function definition, Function call, function arguments and parameter passing, Return statement, **Scope of Variables:** Global variable and Local Variable.

Modules: Writing modules, importing modules, importing objects from modules, Python built-in modules (e.g., Numeric, mathematical module, Functional Programming Module), Packages.

UNIT – V: File Handling: Opening files in different modes, accessing file contents using standard library functions, Reading, and writing files, closing a file, Renaming, and deleting files, File related standard functions.

TEXTBOOKS:

1. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.
3. Ch Satyanarayana, "Python Programming", 1st Edition, universities press (India) private limited 2018.

REFERENCE BOOKS:

1. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014
2. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media, 2011.ISBN-13: 978-9350232873
3. Wesley J Chun, "Core Python Applications Programming", 3rd edition, Pearson Education India, 2015. ISBN-13: 978-9332555365
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python",1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978- 8126562176
5. Reema Thareja, "Python Programming using problem-solving approach", Oxford university press, 2017.

Cyber Security (CST-006)

L:T:P:: 2:0:0 **Credits-0**

Course Objectives: The objectives of this course is to:

1. Familiarize with network security, network security threats, security services, and countermeasures.
2. Be aware of computer security and Internet security.
3. Study the defensive techniques against these attacks.
4. To familiarize with cyber forensics, cybercrimes, and Cyberspace laws.
5. Understand ethical laws of computers for different countries, Offences under cyberspace and the Internet in India.

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

1. Understand cyber-attacks and types of cybercrimes, and familiarity with cyber forensics
2. Realize the importance of cyber security and various forms of cyber-attacks and countermeasures.
3. Get familiar with obscenity and pornography in cyberspace and understand the violation of the Right to privacy on the Internet.
4. Appraise cyber laws and how to protect themselves and, ultimately, the entire Internet community from such attacks.
5. Elucidate the various chapters of the IT Act 2008 power of the Central and State Governments to make rules under IT Act 2008

Syllabus:

UNIT – I: Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, the motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., CIA Triad

UNIT – II: Cyber Forensics: Introduction to cyber forensic, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

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

UNIT – IV: Cyber Security (Organizational Implications): Introduction cost of cybercrimes and IPR issues, web threats

for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing, and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in cyberspace, the ethical dimension of cybercrimes, the psychology, mindset and skills of hackers and other cybercriminals.

UNIT – V: Cyberspace and the Law &Miscellaneous provisions of IT Act.: Introduction to Cyber Security Regulations, International Law. The INDIAN Cyberspace, National Cyber Security Policy. Internet Governance – Challenges and Constraints, Computer Criminals, Assets and Threats. Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.2008.

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.
3. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.
4. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, New Delhi, 2006.
5. Cyberspace and Cybersecurity, George Kostopoulos, Auerbach Publications, 2012.
6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.
7. Cyber Laws and IT Protection, Harish Chander, PHI, 2013.

Introduction To Civil Engineering (CET-0 31)

3L:0T:0P **Credits-04**

Course Objectives: To introduce the Civil Engineering profession and the ethical responsibilities of engineering practice.

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

1. Introduction to what constitutes Civil Engineering.
2. Identifying the various areas available to be used in their field of specialization of Engineering
3. Highlighting the depth of engagement possible within each of these areas.

Syllabus:

UNIT-I **(8 hours)**

What is civil engineering, basics of civil engineering, importance of civil engineering, possible scopes for their field of specialization

UNIT-II **(8 hours)**

Basic knowledge of units and their conversion, surveying classification, ranging, compass surveying, bearings. Water supply system and waste water management

UNIT-III **(8 hours)**

Building materials: brick, stone, cement, concrete and steel. Building classification and components: beam, column, slab, roof and its types, foundation and its types, masonry, plastering

UNIT-IV **(8 hours)**

Transportation: role and advantages, modes, classification of roads, highway cross-section, types of payments, highway materials, traffic, Basic of geotechnical engineering

UNIT-V **(8 hours)**

Fluid mechanics and basic hydraulic engineering, Construction methods of various types of structure, Construction Equipment, Basics of corrosion phenomena and other structural damages, repairs, carbon fiber and **carbon** composite use in repair.

Text Book:

1. Satheesh Gopi, basic civil engineering, dorling Kindersley pvt. Ltd. Pearson publication
2. B.C. Punmia Ashok k. J**ain**, basic civil engineering, Laxmi publication ltd.

Reference books:

1. N.N. Basak, Surveying and levelling, Mc Graw-hill publication.
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017

Basics of Water Treatment (CET-0 32)

3L:0T:0P **Credits-04**

Course Objectives: To familiarize the students with principles, design and operation of various conventional and advanced processes for treatment of water

Course Outcomes:

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

1. Treat water for domestic purpose
2. Gain Knowledge about various process used in Water Treatment
3. Design a suitable method for water treatment

Syllabus:

UNIT-I **(8 hours)**

Introduction to Unit Operations and Processes Involved in Water Treatment, Natural purification of water, Coarse Material Removal Operations: Coarse Screens, Fine Bar Screens, Disc and Drum Screens, Pre-Settling Tank Aeration-Iron and Manganese Removal

UNIT-II **(8 hours)**

Coagulation and Flocculation: Rapid mixing, Flocculation, Different Types of Flocculators, Mechanical Mixers. Sedimentation: Theoretical Concepts, Class-1 Clarification, Class-2 Clarification, Zone Settling, Compression, Resuspension of Particles by Turbulence, Short Circuiting and Dispersion, Different Types of Sedimentation Tanks, Tube Settlers

UNIT-III **(8 hours)**

Filtration: General Features of Rapid Sand and Deep Bed Filters, Filter Media, Characteristics and Preparation, Different Operating Parameters Affecting the Filtration Performance, Hydraulics of Filtration and Backwashing Cycles, Removal Particles, Removal Mechanisms of Filtration.

UNIT-IV **(8 hours)**

Principles of different membrane processes: Reverse Osmosis, Electrodialysis, Nanofiltration, Ultrafiltration, Microfiltration. Effect of Operational Parameters, Membrane antifouling techniques. Removal of nitrate, fluoride, iron, manganese, arsenic etc. from water

UNIT-V **(8 hours)**

Disinfection- Chlorination, UV & Ozonation, Advanced Oxidation Processes. Removal of organics from drinking water: organics in raw water, reactions of organics with disinfections and their health implications, strategies for organic reduction and removal, case studies. Sludge Treatment- Sludge generation & various methods of sludge treatment and disposal from water treatment plants

Text Book:

1. S. Vigneswaran and C. Visvanathan, "Water Treatment Processes: Simple Options", CRC Press.
2. R. L. Droste, "Theory and Practice of Water and Wastewater Treatment", John Wiley

Reference books:

1. S.R. Qasim, Edward and Motley and Zhu, H., "Water Works Engineering – Planning, Design and Operation", Prentice Hall, India
2. Weber, W.J., "Physico-chemical Processess", Wiley Interscience

Surveying measurements and Adjustments (CET-033)

3L:0T:0P **Credits-04**

Course Objectives: To introduce the various concepts of field surveying .

Course Outcomes:

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

1. Identified various maps and equipment used in surveying
2. Measure general topography of ground.
3. Rectify measurements done in field by various Instruments.

Syllabus:

UNIT-I **(8 hours)**

Principles of surveying, Various maps and their scales, Symbols and colours, Generalization of information, Surveying measuring equipment & techniques - Distance, Height, Angles and Directions. Compass Surveying: Bearings and Azimuths

UNIT-II **(10 hours)**

Levelling: Balancing of sights, Differential leveling, profile and cross-section leveling, reducing the levels- Height of Instrument and Rise & Fall method. Contouring, Trigonometrical Leveling and Tacheometric surveying

UNIT-III **(8 hours)**

Methods of control establishment: Traversing, Traverse computations and adjustments. Triangulation and Trilateration, Plane Table Surveys

UNIT-IV **(8 hours)**

Modern surveying equipment- Total Station, Concept of observation and model, The mathematical model and errors, Random and systematic errors, Purpose of adjustments

UNIT-V **(6 hours)**

Least squares adjustment techniques, Adjustment by linear and non-linear functions in the model, Adjustment by observation equation (variation of parameters) and condition equation methods.

Text Book:

1. Duggal S. K., "Surveying Vol 1 & 2" Tata McGraw Hill.
2. Subramanian R., "Surveying and Levelling" Oxford Higher Education
3. Gopi, S. Sathikumar, R. and Madhu. N, "Advanced Surveying" Pearson Publication

Reference books:

1. Arora, K.R., "Surveying", Vol. I, II and **III**, Standard Book House. 1995.
2. Chandra, A.M., "Surveying", New Age Publishers. 2002

Basic Structural Analysis (CET004)

3L:1T:0P **4 credits**

OBJECTIVE:

1. To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary structures.

OUTCOMES:

The students will be able to

1. Analyse trusses and study displacement response of statically determinatestructural systems using energy methods:
2. apply unit load method and strain energy method for determination of deflection of statically determinate beams, frames & pin jointed trusses
3. Analyse statically indeterminate structures using strain energy method and methodof consistent deformation
4. know about moving loads and influence lines
5. Know about Statically determinate and indeterminate suspension bridges and arches

Detailed Content:

UNIT 1 - Truss Analysis **(8 Hours)**

Analysis of determinate truss- Methods of joints and sections. Degree of static and kinematic determinacies, Introduction to force and displacement methods

UNIT II - Moving loads and influence lines **(8 Hours)**

Introduction to moving loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams - analysis for different types of moving loads - single concentrated load - several concentrated loads, uniformly distributed load on shorter and longer than the span.

UNIT III - Cables and Suspension Bridges **(8 Hours)**

Analysis of forces in cables under concentrated and uniformly distributed loads - Anchor Cables Un-stiffened suspension bridges, maximum tension in the suspension cable and backstays, pressure on towers.

UNIT IV – Arches **(8 Hours)**

Theory of arches - Eddy‟s theorem - analysis of three hinged arches-Support reactions-normal thrust and Radial shear at any section of a parabolic and segmental arch due to simple cases of loading. Moving loads on three hinged arches

UNIT V- Elastic theorems and energy principles (8 Hours)

Strain energy due to axial load, bending moment, shear and torsion - strain energy method, Castigliano's method for deflection, Unit load method-Betti's theorem – Maxwell's law of reciprocal deflections - principle of least work - application of unit load method and strain energy method for determination of deflection of statically determinate beams, frames - pin jointed trusses.

Text Books:

1. Gere and Timoshenko, Mechanics of materials, CBS. Publishers
2. Kenneth Leet,Chia M Uang& Anne M Gilbert., Fundamentals of Structural Analysis,McGraw Hill
3. R.Vaidyanathan and P.Perumal, Comprehensive Structural Analysis Volume I & II,Laxmi Publications (P) Ltd
4. Wang C.K., Intermediate Structural Analysis, McGraw Hill

References:

1. AslamKassimali., Structural Analysis, Cenage Learning
2. Chandramouli P N, Structural Analysis I –Analysis of Statically Determinate Structures, Yes DeePublishingPvt Ltd.,Chennai,Tamil Nadu.
3. DevdasMenon, Structural Analysis, Narosa Publications
4. Hibbeler., Structural Analysis, Pearson Education
5. Kinney S., Indeterminate Structural Analysis, Oxford & IBH
6. M.L. Gambhir, Fundamentals of structural Mechanics and analysis, Printice Hall India
7. Reddy C.S., Indeterminate Structural Analysis, Tata McGraw Hill
8. Timoshenko S.P.& Young D.H., Theory of Structures, McGraw Hill

Suggested reading material:

1. Khanna, S.K. and Justo, C.E.G., "Highway Engineering", Nem Chand & Bros. 2004
2. Khanna, S.K. and Justo, C.E.G., "Highway Material Testing Manual", Nem Chand & Bros. 2004
3. Kadiyali, L.R., "Traffic Engineering and Transportation Planning", Khanna Publishers. 2002
4. Sharma, S.K., "Principles and Design of Highway Engineering", S.Chand& CO. 1995
5. Papacostas, C.S. and Prevedouros, P.D., "Transportation Engineering and Planning", Prentice Hall. 2002
6. JotinKhisty, C. and Kent Lall,B., "Transportation Engineering- An Introduction",Prentice Hall

Concrete Technology (CET005)

3L:1T:0P **4 credits**

OBJECTIVE:

1. To study the behavior of various materials used in Concrete.
2. To study physical and mechanical properties of fresh and hardened concrete
3. To study the different codes of practices for the preparation of concrete
4. To study the preparation and properties of special type of concrete

OUTCOMES:

1. Identify Quality Control tests on concrete making materials
2. Understand the behavior of fresh and hardened concrete
3. Design concrete mixes as per IS and ACI codes
4. Understand the durability requirements of concrete
5. Understand the need for special concretes

Detailed Content

UNIT -I: Concrete as a Building Material and its gradients (8 Hours)

(i) Cement: Manufacture of Portland Cement, its composition, Hydration of cement, physical and chemical properties, concept of strength development. Gel space Ratio, Powers Law. Gel structure.

(ii) Testing of Cement for general physical and chemical properties as per BIS specifications.

(iii) Different types of cement such as Slag Cement, Portland Pozzolona Cement and high Alumina cement, their characteristics, composition, use and properties.

UNIT -II: Aggregates and Testing of Aggregates (8 Hours)

Classification, source, physical and mechanical properties. Testing of Aggregates for physical and mechanical properties.

UNIT -III: Production of Fresh Concrete (8 Hours)

(i) Proportioning of concrete, operations involved in concrete production, Workability, Factors Affecting workability, Measurement of workability. Problem of Segregation and bleeding and Laittance.

(ii) Properties of Hardened Concrete.
Strength and durability, Factors affecting strength and durability of concrete. Mechanics of setting and hardening of concrete

UNIT -IV: Concrete Mix Design **(8 Hours)**
Principle and Methods, Statistical Quality control. Concrete Rheology, Maturity concept.

Introduction to special concretes **(8 Hours)**
(a) Admixtures in concrete.

(b) Special concrete as lightweight concrete. High Density Concrete, Sulpher Impregmented concrete Polymer concrete, Lime concrete constituents and uses.

(c) High strength concrete (d) Fibre Reinforced Concrete (e) High performace concrete, Ready mix concrete and mass concrete

UNIT -V: Material testing and instrumentation **(8 Hours)**
Conventional vs. Non-Destructive Testing. Methods & Principles of NDT.

TEXT/REFERENCE BOOKS:

1. S S Rattan, "Strength of Materials", McGraw Hill Education.
2. M L Gambhir, "Fundamentals of Solid Mechanics", Prentice Hall India Learning Private Limited.
3. James M. Gere, Barry J. Goodno, "Mechanics of Materials", 8th edition,Cenage Learning.
4. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, NewYork, USA.
5. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
6. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: PearsonPrentice Hall, 2004
7. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979
8. Mechanics of Materials - Ferdinand P. Beer, E. RusselJhonston Jr., John T. DEwolf– TMH 2002.
9. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

Fluid Mechanics (CET006)

3L:1T:0P **4 credits**

COURSE OBJECTIVE:

- To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications ofAerodynamics, Hydraulics, Marine Engineering, etc.
- To give fundamental knowledge of fluid, its properties and behavior under various conditions ofinternal and external flows.
- To give fundamental knowledge of fluid, its properties and behavior under various conditions ofinternal and external flows.
- To develop understanding about hydrostatic law, principle of buoyancy and stability of a floatingbody and application of mass, momentum and energy equation in fluid flow.
- To imbibe basic laws and equations used for analysis of static and dynamic fluids.
- To inculcate the importance of fluid flow measurement and its applications in Industries.
- To determine the losses in a flow system, flow through pipes, boundary layer flow and flow pastimmersed bodies.

EXPECTED OUTCOMES:

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

PROPOSED SYLLABUS:

UNIT 1: Basic Concepts and Definitions (8 Hours)

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

UNIT 2: Fluid Statics (8 Hours)

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

UNIT 3: Fluid Kinematics (8 Hours)

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

- dimensional continuity equations in Cartesian coordinates

UNIT 4: Fluid Dynamics & Dimensional Analysis (8 Hours)

Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation; venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by

fluid flow on pipe bend; Vortex Flow – Free and Forced;Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.

UNIT5: Laminar & Turbulent Flow, Boundary Layer Analysis (8 Hours)

Equation of motion for laminar flow through pipes, Stokes law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, scale and intensity of turbulence, measurement of turbulence, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Flow through pipes and pipe networks, Head loss in pipes, Equivalent pipes.

Boundary layer thickness, boundary layer over a flat plate, application of momentum equation, turbulent boundary layer, laminar sub layer, separation and its control, Drag and lift, drag on a sphere.

TEXT/REFERENCE BOOKS:

- P. Balachandran, "Engineering Fluid Mechanics", Prentice-Hall of India Pvt. Ltd.
- Dr. R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines", LaxmiPublications.
- Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, OxfordUniversity Press, 2010
- Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
- Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J.Finnemore, International Student Edition, McGraw Hill.

Basic Structural Analysis Lab (CEP005)

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

COURSE OBJECTIVES

The objective of structural analysis laboratory is to determine the forces, stresses, deflections and behaviour of various structural members like beams, arches, trusses and frames when subjected to different types of loadings. Equipment consists of simply supported beam, fixed beam, two hinged and three hinged arch model, unsymmetrical bending apparatus, pin jointed truss apparatus etc.

COURSE OUTCOMES:

At the end of the course:

1. The student will be able to distinguish between statically determinate and indeterminate structures.
2. The student will be able to apply equations of equilibrium to structures and compute the reactions.
3. The student will be able to draw the shear force and bending moment diagrams.
4. The student will be able to calculate the internal forces in cable and arch type structures.
5. The student will be able to calculate the deflections of truss structures, beams, and portal frames.

LIST OF PRACTICALS:

1. Experiment on a 2 hinged arch for horizontal thrust and influence line for horizontal thrust.

2. Experimental and analytical study of a 3 bar pin jointed truss.

3. Experimental and analytical study of deflection and unsymmetrical bending of a cantilever beam.

- Begg deformeter- verification of Muller Breslau principle.
- Experimental and analytical study of an elastically coupled beam.

4. Sway in portal frames- demonstration.

5. To study the cable geometry and statics for different loading condition.

6. To plot stress –strain curve for concrete. Use of mechanical and electrical strain.

Text Books:

1. Gere and Timoshenko, Mechanics of materials, CBS. Publishers
2. Kenneth Leet,Chia M Uang& Anne M Gilbert., Fundamentals of Structural Analysis,McGraw Hill
3. R.Vaidyanathan and P.Perumal, Comprehensive Structural Analysis Volume I & II,Laxmi Publications (P) Ltd

Concrete Technology Lab (CEP006)

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

COURSE OBJECTIVES

1. To know the concept and procedure of different type of test conducted on aggregate and finished concrete.
2. To understand the procedure of designing the concrete mix of given specification of its ingredients along with appropriate water cement ratio and admixtures.

COURSE OUTCOMES

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

1. Perform different tests conducted on aggregate and concrete at site.
2. Perform non-destructive test on concrete.
3. Design the concrete mix as per the site conditions and specification of materials available there.

LIST OF PRACTICALS:

1. Fineness modulus and grain size distribution
2. Abrasion test on aggregate
3. Slump Test
4. Workability of concrete
5. Concrete mixed design as per Indian Standard recommendation guidelines.
6. Effect of water cement ratio on the strength of concrete

TEXT/REFERENCE BOOKS:

1. S S Rattan, “Strength of Materials”, McGraw Hill Education.
2. M L Gambhir, “Fundamentals of Solid Mechanics”, Prentice Hall India Learning Private Limited.
3. James M. Gere, Barry J. Goodno, “Mechanics of Materials”, 8th edition,Cenage Learning.

Fluid Mechanics Lab (CEP007)

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

COURSE OBJECTIVES:

The course should enable the students to:

1- Enrich the concept of fluid mechanics.
2- Demonstrate the classical experiments in fluid mechanics.
3- Correlate various flow measuring devices such as Venturi meter, orifice meter and notches etc.

COURSE OUTCOMES:

1- Students will be Understanding of basic physics of fluids.
2- Students Gaining knowledge to calculate and design engineering applications involving fluid.
3- Students will be Understanding of analyzing flow systems in terms of mass, momentum, and energy balance.
4- Students will be Understanding the concept of pipe friction and knowledge of fluid machinery models .

LIST OF PRACTICAL:

1. Measurement of viscosity
2. Study of pressure measurement devices
3. Hydrostatic force and center of pressure on flat/curved surfaces
4. Stability of Floating body
5. Study Characteristics of Laminar and Turbulent flows (Reynolds experiment)
6. Verification of Bernoulli Theorem
7. Determine Hydraulic coefficients of a small circular orifice.
8. Calibration of flow measuring devices(Venturi meter , Orifice meter , Rectangular and V-notch)
9. Pipe friction
10. Similitude and Model Studies

TEXT/REFERENCE BOOKS:

- P. Balachandran, “Engineering Fluid Mechanics”, Prentice-Hall of India Pvt. Ltd.
- Dr. R. K. Bansal, “A Textbook of Fluid Mechanics and Hydraulic Machines”, LaxmiPublications.
- Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, OxfordUniversity Press, 201

Basics Of Geomatics Engineering CET-0 34)

3L:1T:0P **4 credits**

Course Objectives: To impart knowledge about basic principle of field surveying procedures and practices for civil engineering applications.

Course Outcomes:

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

1. To enable the students to understand and apply the basic concepts of geospatial analysis.
2. To augment imagination of students so that they can visualize 3D models before the construction of civil work
3. To enhance the capabilities of student in analysis of survey data which is very important for designing a civil engineering work

Syllabus:

UNIT-I **(8 hours)**

Introduction, history of geomatics engineering, Fundamentals of remote sensing, EMR, Platforms and sensors, visual image interpretation, Types of remote sensing and their applications, resolutions in remote sensing

UNIT-II **(8 hours)**

Introduction to digital image processing, data formats, image pre-processing- radiometric **&** geometric, remote sensin image distortion and rectification, georeferencing, image enhancement, transformation, classification, classification algorithms, accuracy assessment, image fusion and change detection.

UNIT-III **(8 hours)**

Photogrammetry - advantages and disadvantages, types of photographs, and geometry of aerial photograph, scale of tilted photograph. relief displacement, flight planning. Stereoscopy, introduction, types of stereoscopes, base lining, parallax and its use for elevation determination, Introduction to LiDAR, UAV photogrammetry

UNIT-IV **(8 hours)**

GIS- Introduction, Data Sources, Data Models and Data Structures, Algorithms, DBMS, Creation of Databases (spatial and non-spatial), Spatial analysis - Interpolation, Buffer, Overlay, Terrain Modelling and Network analysis

UNIT-V **(8 hours)**

GNSS- Principle used, Components of GNSS, Data collection methods, DGPS, Errors in observations and corrections

Text Book:

4. Duggal S. K., "Surveying Vol 1 & 2" Tata McGraw Hill.
5. Subramanian R., "Surveying and Levelling" Oxford Higher Education

Reference books:

3. Arora, K.R., "Surveying", Vol. I, II and **III**, Standard Book House. 1995.

2. Chandra, A.M., "Surveying", New Age Publishers. 2002

Basics of Water Quality Management (CET-0 35)

3L:0T:0P **Credits-04**

Course Objectives: To impart understanding of various aspects related to quality, pollution and remediation of natural water resources

Course Outcomes:

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

1. Gain knowledge about quality of water required for various purpose
2. Find the causes of water pollution
3. find out various sources of water

Syllabus:

UNIT-I **(12 hours)**

Introduction: Source and nature of water pollution, strategy for water quality management, water quality standards, laws and regulations

Rivers and Streams: River hydrology and river pollution, spills and continuous discharge of residual material from point and non-point sources, initial mixing, oxygen demanding wastewaters, nutrients VOCs Streeter-Phelps model and other models, fate of bacteria (indicator bacteria pathogens and viruses, restoration and management strategy).

UNIT-II **(10 hours)**

Lakes and Reservoirs: Physical and hydrologic characteristics, natural processes, water quality models (completely mixed, vertical, two dimensional), eutrophication, phytoplankton models, phytoplankton – nutrient – DO relationships, restoration and management strategy

UNIT-III **(8 hours)**

Ground Water: Introduction, natural ground water quality, sources and ground water pollution, transport processes (sorption, decay, combined) transport models for instantaneous and continuous point sources and non-point sources, non-aqueous phase liquids, remediation strategy

UNIT-IV **(6 hours)**

Wetlands and Watersheds: Introduction, natural and constructed wetlands, wetland hydrology, water generated pollutant loads, urban and agricultural water sheds, air sheds.

UNIT-V **(4 hours)**

Estuaries, Bays and Harbors: Estuarine hydrology, tides and tidal currents, water quality in estuaries, water quality models.

Textbook:

1. Masters, G.M. and Ela, "Introduction to Environmental Engineering and Science", PHI Learning
2. Thomann, R.V., Mueller, J.A., "Principles of Surface Water Quality Modelling and Control", Harper and Row Publishers

Reference books:

1. Chin, David A., "Water Quality Engineering in Natural Systems", Wiley – Inter science

Principle of Photogrammetry (CET-0 36)

3L:0T:0P **Credits-04**

Course Objectives: To introduce the various concepts of photogrammetry.

Course Outcomes:

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

1. Evaluate the photographs for various requirements
2. Find out the Orientation of photographs
3. Gain knowledge of various instruments used for Photogrammetric mapping

Syllabus:

UNIT-I **(8 hours)**

Photogrammetry - Types of photographs, Scale determination, Flying Height, Relief and Tilt Displacements, Stereovision, Base Lining, Parallax Bar

UNIT-II **(8 hours)**

Height determination from Stereo Photographs, Flight Planning, Porro-Koppe , Reprojection principle, Double reprojection, Equivalent and calibrated focal length of lens and concept of principal distance

UNIT-III **(8 hours)**

Concepts of orientation: Interior, Relative and Absolute Orientation of Aerial Photographs, Optical—Mechanical, Graphical and Numerical methods of Relative orientation, Over-correction factors and its determination

UNIT-IV **(6 hours)**

Model deformations, Residual errors, and precision of Inner and Relative Orientation, Relative Orientation in hilly terrain and in difficult country

UNIT-V **(10 hours)**

Stereo-plotting Instruments: 1st, 2nd & 3rd order instruments, General principle of calibration, Testing and adjustment of instruments. Photogrammetric mapping: Basic idea of control requirement and photogrammetric extension of control. Fundamentals of close Range Photogrammetry, Application in Engineering and non- topographic fields

Text Book:

1 Duggal S. K., "Surveying Vol 1 & 2" Tata McGraw Hill.

2 Subramanian R., "Surveying and Levelling" Oxford Higher Education

Reference books:

1 Arora, K.R., "Surveying", Vol. I, II and **III**, Standard Book House. 1995.

2 Chandra, A.M., "Surveying", New Age Publishers. 2002

4. Moffitt, F.H. and Mikhail, E.M., "Photogrammetry", 3rd Ed., Harper and Row Publisher

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICALUNIVERSITY
(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)
Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- www.uktech.ac.in)

SYLLABUS

For

B.TECH

(Civil Engineering)

3RD Year

Effective From – Session 2024-25

SEMESTER-V

Sl. No.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	CET007	DC	Reinforced concrete Structure	3	1	0	30	20	50	100		150	4
2	CET008	DC	Soil Mechanics	3	1	0	30	20	50	100		150	4
3	CET009	DC	Advance Structure Analysis	3	1	0	30	20	50	100		150	4
4	CET010	DC	Hydraulics and Hydraulic Machine	3	0	0	30	20	50	100		150	3
	CET011		Engineering Geology										
	CET012		Building Planning Architecture										
5	CET013	PEC	Hydrology	3	0	0	30	20	50	100		150	3
	CET014		Urban and Town Planning										
	CET015		Safety Management in Construction										
6	CEP009	DLC	Reinforced concrete Structure	0	0	2		25	25		25	50	1
7	CEP010	DLC	Soil Mechanics	0	0	2		25	25		25	50	1
8	CEP011	DLC	Civil Engineering Software lab	0	0	2		25	25		25	50	1
9	CEP012	DLC	Mini Project-II or Internship-II*	0	0	2			50			50	1
10	AHT 009/ AHT 010	MC	Constitution of India / Essence of Indian Traditional Knowledge	2	0	0	15	10	25	50			
11	GP005	NC	General Proficiency						50				
			Total	**17**	**3**	**8**						**950**	**22**
12	*		**Open Elective (Optional/Minor) For other branch**	3	1	0	30	20	50	50			**4**

*TheMiniProject-IIorInternship-II(4-6weeks)conductedduringsummerbreakafterIVsemesterandwillbeassessedduringVsemester

MOOCs course

SEMESTER-VI

~~Sl.No.~~	~~Subject Codes~~	~~Category~~	~~Subject~~	Periods			Evaluation Scheme					Subject Total	Credit
							~~Sessional Exam~~			~~ESE~~			
				L	T	P	CT	TA	Total	TE	PE		
1	CET016	DC	Transportation Engineering	3	1	0	30	20	50	100		150	4
2	CET017	DC	Design of Steel Structure	3	1	0	30	20	50	100		150	4
3	CET018	DC	Environmental Engineering	3	1	0	30	20	50	100		150	4
4	CET019	PEC	Foundation Engineering	3	0	0	30	20	50	100		150	3
	CET020		Cost effective and Eco friendly Structure										
	CET021		Structural Health Monitoring										
5	AHT011	HSC	Total Quality Management	3	0	0	30	20	50	100		150	3
	AHT 012		Managing E- Commerce and Digital communication										
	AHT 013		Industrial Safety and Hazard Management										
6	CEP013	DLC	Transportation Engineering Lab	0	0	2		25	25		25	50	1
7	CEP014	DLC	Steel Structure Lab	0	0	2		25	25		25	50	1
8	CEP015	DLC	Environmental Engineering Lab	0	0	2		25	25		25	50	1
9	AHT 010// AHT 009	MC	Essence of Indian Traditional Knowledge / Constitution of India	2	0	0	15	10	25	50			
10	GP 006	NC	General Proficiency						50				
			Total	**17**	**3**	**6**						**900**	**21**
11	*		**Open Elective (Optional) For other branch**	3	1	0	30	20	50	50			**4**
	CEP016	DLC	Mini Project-III or Internship-III*	To be completed at the end of sixth semester (during Summer									
12	AHT 014	Audit	Happiness and well= being	2	0	0	25	25	50				

MOOCs course

***Detail in Annexure**

Reinforced Concrete Structure (CET007)

L: T: P:: 3:1:0 **Credits-4**

COURSEOBJECTIVES:

1. Tostudyaboutmaterialsinvolvedinreinforcedconcretestructures.
2. Tostudyaboutthemethodsof reinforcedconcreteconstruction.
3. To study the behavior and design of reinforced concrete beams and one-way slabs consideringdeflections,flexure,shearand anchorage.
4. Tostudythe behavioranddesign ofcolumnsincludingslendernesseffects.
5. Tolearndesignofstaircase,footingsandretainingwalls.

COURSEOUTCOMES:

6. Studentswillunderstandthegeneralmechanicalbehaviorofreinforcedconcrete.
7. Studentswill beabletoanalyzeanddesignreinforcedconcreteflexural members.
8. Studentwillbeabletoanalyzeanddesignreinforcedconcretecompressionmembers.
9. Studentswill beabletoanalyzeanddesignforverticalandhorizontal shearinreinforcedconcrete.
10. Studentswill beabletoanalyzetransferanddevelopmentlengthofconcretereinforcement.
11. Studentswillbeabletoanalyzeanddesignfordeflectionandcrackcontrolofreinforcedconcrete members.
12. Studentswill beabletoidentifyand applytheapplicableindustrydesigncodes relevanttothedesignofreinforced concrete members.

Syllabus:

UNIT-I **(8 hours)**

PropertiesofConcrete: Compressivestrength,tensilestrength,stress-strainbehaviour, modulusofelasticity,shrinkage,creep,characteristicstrength,gradesofconcrete,designstress-straincurveofconcrete,reinforcingsteel,typesandgrades,stress-strain curve.

UNIT-II **(8 hours)**

BasicConceptsofReinforcedConcreteDesign: Workingstressandlimitstatedesignmethods.DesignofR.CBeamsinFlexure&Torsion:Singlyanddoublyreinforced rectangular/flangedsections,designforshear,bondandanchorageofreinforcement,limitstatesof deflection andcracking.

UNIT-III **(8 hours)**

Slab&Staircase: One-wayandtwo-wayslabs,designofstaircases.

UNIT-IV **(8 hours)**

Designofcompressionmembers:
Designofcompressionmembersforaxialloadsandaxialloadplusuniaxialmoment.
Foundationtypes,designofisolatedfootings,introductionto combinedfootings.

UNIT-V **(8 hours)**

Retainingwalls: Stabilityanalysisofretainingwall,designofgravitywall,cantilevertype retainingwalls.

TEXTBOOKS:

1. Shah,V.L.et.al.,"LimitStateTheoryandDesignofReinforcedConcrete", StructuresPublications. 2007
2. Pillai,S.U.andMenon,D.,"ReinforcedConcreteDesign",Tata McGrawHill. 2003
3. Varghese,P.C.,"LimitStateDesignofReinforcedConcrete",Prentice-Hall 2002
4. Park,R.andPauley,T.,"ReinforcedConcreteStructures",JohnWiley 1976
5. Gambhir,M.L.,"FundamentalsofReinforcedConcreteDesign", PrenticeHallofIndia. 2006

SOIL MECHANICS (CET-008)

3L:1T:0P **Credits-4**

Course Objectives:

- To understand the engineering properties of soil and identify the problematic soils.
- To evaluate the soil shear strength for different types of soil and in different conditions of weather.
- To analyse the soil behavior under loading and the stresses developed within soil mass for saturated and unsaturated conditions.
- To apply the knowledge of soil compressibility and consolidation theory in practice to estimate settlement.

Course Outcomes:

After the completion of this course, the student will be able to:

1. Know about the theory of elasticity and its application in Soil Mechanics.
2. Get a detailed idea about the pore water pressure due to undrained loading and seepage.
3. Get detailed information about consolidation in soil media.
4. Get a clear idea about shear stress and stress paths.
5. Understand the concept of critical state soil mechanics.

Syllabus:

UNIT-I **(8 hours)**

Engineering Geology: Geological processes, rock forming minerals, rock types and their engineering properties. Structural geology: Dip, strike, faults, folds, joints, their formation and importance in respect of civil engineering structures, rock mass movements, causes of landslides.

UNIT-II **(8 hours)**

Elementary properties: Soil types, composition, three phase relations, Physical properties: Specific gravity, water content, in-situ density, consistency of soils, grain size distribution curves, relative density, IS soil classification system, soil structure and clay mineralogy.

UNIT-III **(8 hours)**

Capillarity and Permeability: Darcy's law, determination of coefficient of permeability, factors affecting permeability, equivalent permeability of stratified soils, in-situ permeability test, effective stress, seepage analysis, 1-D flow, Laplace's equation, flow nets, uplift pressure, confined and unconfined flows, piping failure, filter criteria.

UNIT-IV **(8 hours)**

Compressibility: Compaction: General principles, Proctor tests, factors affecting compaction, field compaction, compaction techniques.

Consolidation: Fundamentals, 1-D consolidation, normally and over-consolidated soil, void ratio – pressure relationships, compressibility characteristics, time rate of consolidation, coefficient of consolidation, curve fitting techniques, settlement analysis, secondary consolidation, vertical sand drains.

UNIT-V **(8 hours)**

Shear strength of Soil: Principle of effective stress, Mohr-Coulomb failure criterion, direct shear test, unconfined compression test, triaxial shear test: unconsolidated undrained, consolidated undrained, consolidated drained, vane shear test.

Text Book:

1. Terzaghi, K. and Peck, R.B., "Soil Mechanics in Engineering Practice", John Wiley, 1967.

Reference books:

2. Lambe, T. William and Whitman, Robert V., "Soil Mechanics", John Wiley, 2000.
3. Craig, R.F., "Soil Mechanics", Chapman & Hall, 1993.

4. AtkinsonJ.H,“An introduction to the Mechanics of soils and Foundation”,McGraw-HillCo., 1993

Advance Structure Analysis (CET009)

L: T: P:: 3:1:0 **Credits-4**

CourseObjectives

1. Toequipthestudentswiththeforceanddisplacementmethodsof structural analysiswithemphasisonanalysis of continuous beams and frames.

CourseOutcomes

Thestudents willbe ableto

1. Analyzestructuresusingforcemethod
2. Analyzestructuresusingdisplacement method
3. learnClapeyronstheoremanditsapplications
4. Analyzestructuresusingmatrixmethods
5. Analyzestructuresusingplasticanalysis

Syllabus:

UNIT-I **(8 hours)**

SlopeDeflectionMethod:Analysisofcontinuousbeamswithvariousloadings-beamswithoverhang-analysisofrigid-frameswithoutswayandwithsway-differenttypesofloads- settlementeffects

UNIT-II **(8 hours)**

MomentDistributionMethod:Distributionfactors,Analysisofcontinuousbeamswithvarious loadings-beamswithoverhang-analysisofrigidframeswithoutswayandwithsway–sinkingeffect

UNIT-III **(8 hours)**

PlasticAnalysis: Plastictheory–Staticallyindeterminatestructures–Plasticmomentofresistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism –collapseload– Staticandkinematicmethods–Upperandlowerboundtheorems–Plastic analysisofindeterminatebeamsandframes.

UNIT-IV **(8 hours)**

Clapeyron'sTheorem(ThreeMomentEquation): Derivationofthreemomentequation-applicationofthreemomentequationforanalysisofcontinuousbeamsunderthe effectofappliedloadsand uneven supportsettlement

UNIT-V **(8 hours)**

MatrixMethods: IntroductiontoMatrixMethods:Analysisoftwoandthreespancontinuous BeamsandsimpleframebyFlexibilityandStiffnessMatrixmethods.

Text/ReferenceBooks

- Reddy,C.S.,"BasicStructuralAnalysis",TataMCGrawHill.
- James,M.Gere,"MechanicsofMaterials",5thEd.,NelsonThorens
- Ramamrutham.S,NarayanR,Theoryofstructures,DhanpatRai Publishingcompany,edition9
- HibblerRC,structural Analysis,Pearson,9th edition

HYDRAULICS AND HYDRAULIC MACHINES(CET010)

(3L:0T:0P) **Credit 3**

Course Objectives: The objective of the course is

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

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

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

Unit – I **[08 Hours]**

Open Channel Flow – I: Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channels, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient "n". 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 **[8Hourse]**

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 **[06 Hourse]**

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

Unit – IV **[08 Hourse]**

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 **[12Hourse]**

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

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

TEXT BOOKS & REFERENCE 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 & Hydraulic Machines, Domkundwar&DomkundwarDhanpat Rai &Co.
4. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd
5. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria& Sons Publications Pvt. Ltd.).
6. Open channel flow by V.T. Chow (McGraw Hill Book Company).
7. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited.
8. Hydraulic Machines by Banga & Sharma (Khanna Publishers).

ENGINEERING GEOLOGY (CET-011)

3L:0T:0P **Credit 3**

Course Objectives: At the end of this course the students will be able to understand the importance ofgeological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor

Course Outcomes:

1. Understand scope of engineering geology and identify different types of rocks, minerals and building stones.
2. Understand geological concepts and approaches of weathering of rocks.
3. Understand the structural geology terms like dip, strike, joints and learn about earthquake.
4. Understand geographical concepts and terminology.

Syllabus:

UNIT-I **(8 hours)**

Physical geology: Geology in civil engineering – branches of geology – structure of earth and it compositionweathering of rocks – scale of weathering – soils – landforms and processes associated with river, wind, groundwater and sea – relevance to civil engineering. Plate tectonics – Earth quakes –Seismic zones in India.

UNIT-II **(8 hours)**

Mineralogy:Physical properties of minerals – Quartz group, Feldspar group, Pyroxene – hypersthene andaugite, Amphibole – hornblende, Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT-III **(8 hours)**

Petrology: Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks.Engineering properties of rocks. Description, occurrence, engineering properties, distribution anduses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT-IV (8 hours)

Structural geology and geophysical methods: Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civilengineering. Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT-V (8 hours)

Application of geological investigations: Remote sensing for civil engineering applications; Geological conditions necessary fordesign and construction of Dams, Reservoirs, Tunnels, and Road cuttings – Hydrogeologicalinvestigations and mining – Coastal protection structures. Investigation of Landslides, causes andmitigation.

Text Book:

1. Bell, F.G. “Engineering Geology”, 1967.
2. KesavuluChenna, N. “Engineering Geology”, Second Edition, Pvt. Ltd.
3. Singh, Parbin.“Engineering and General Geology”, Pvt. Ltd.
4. Philpotts, A., & Ague, J. (2009). Principles of igneous and metamorphic petrology. Cambridge University Press.
5. Raymond, L. A. (2002). Petrology: the study of igneous, sedimentary, and metamorphic rocks. McGraw-Hill Science Engineering.

Reference books:

6. G W Tyrrell. (1926). Principles of Petrology. Springer
7. Park, R. G. (2004) Foundations of Structural Geology.Chapman& Hall.
8. Lahee F. H. (1962) Field Geology. McGraw Hill
9. Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor & Francis
10. Gross, M. G. (1977). Oceanography: A view of the earth

BUILDING PLANNING & ARCHITECTURE(CET-012)

3L:0T:0P **Credit 3**

Course Objectives:

1. To understand the concept of building planning and architecture.
2. To understand the various building codes to be followed while planning a building.
3. To have the knowledge of various building components.

Course Outcomes:

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

. 1. Have understanding of building planning, orientation, drawing and architectural aspects.

2. Representation of a building on Paper

Syllabus:

UNIT-I **(6 hours)**

Drawing of Building Elements- Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of door, window and ventilator, lintels and arches, stairs and staircases

UNIT-II **(8 hours)**

Building Planning- Classification of buildings, Provisions of National Building Codes and Rules, Building bye-laws, open area, Setbacks, FAR terminology, Design and drawing of Building, Design concepts and philosophies, Preparing sketch plans and working drawings of various types of buildings like residential building, institutional buildings and commercial buildings, site plans, presentation techniques, pictorial drawings, perspective and rendering, model making, introduction to computer aided design and drafting, Applying of principle of architectural composition (i.e. unity, contrast, etc.), Principles of planning, orientation in detailed drawings.

UNIT-III **(8 hours)**

Building Services- Introduction of Building Services like water supply, sewerage and drainage systems, sanitary fittings and fixtures, plumbing systems, principles of internal & external drainage systems, principles of electrification of buildings, intelligent buildings, elevators & escalators their standards and uses, air-conditioning systems, fire fighting systems, building safety and security systems, ventilation and lightening and staircases, fire safety, thermal insulation acoustics of buildings,

UNIT-IV **(10 hours)**

Principles of architectural design – Definition of architecture, factors influencing architectural development, characteristics features of style, historic examples, creative principles.

Principles of architectural composition – Unity, balance, proportion, scale, rhythm, harmony, Accentuation and contrast. Organizing principles in architecture - Symmetry, hierarchy, axis linear, concentric, radial, and

asymmetric grouping, primary and secondary masses, Role of color, texture, shapes/forms in architecture. Architectural space and mass, visual and emotional effects of geometric forms, space activity and tolerance space. Forms related to materials and structural systems.

Elements of architecture: Functions – Pragmatic utility, circulatory function , symbolic function, physiological function. Structure – Physical structure, Perceptual structures. Space in architecture – Positive and negative space. Aesthetics: Visual perception. Protective: Protection from climate and other elements, architecture a part of the environment. Comfort factors.

UNIT-V **(8 hours)**

Perspective Drawing and Town Planning- Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings. Concepts of master plan, structure plan, detailed town planning scheme and action plan, estimating future needs planning standards for different land use, allocation for commerce, industries, public amenities, open areas etc., planning standards for density distributions, density zones, planning standards for traffic network, standard of roads and paths, provision for urban growth, growth models, plan implementation, town planning legislation and municipal acts, panning of control development schemes, urban financing, land acquisition, slum clearance schemes, pollution control aspects

Text Book:

1. .Shah, Kale &Patki; Building Design and Drawing; TMH
2. Malik &Meo; Building Design and Drawing
3. Agrawal S. C., Architecture and Town Planning, Dhanpat Rai & Co.
4. S. C. Rangwala, Town Planning, Charotar Publishing House.
5. Lewis Keeble, Principles and Practice of Town and Country Planning.
6. Rame Gouda, Principles & Practices of Town Planning, University of Mysore, Manasa Gangotri

Reference books:

1. W B Mckay,OrientBlackswan Building Construction Vol 1 -4, Pearson
2. Gurucharan Singh & Jagdish Singh, Building Planning, Designing and Scheduling, Standard Publishers Distributors.
3. Layal JS, Dongre A, Building Design and Drawing, Satya Prakashan
4. Ghose D.N., Civil Engineering Design and Drawing, CBS publisher

HYDROLOGY(CET013)

(3L:0T:0P) **Credit:3**

Course Objectives:

This course is aimed at teaching students

1. To understand the concept of hydrology
2. Computational analysis for the design and management of water resources projects.
3. It gives a practical approach to the various facets of the subject
4. Emphasizes the application of hydrological knowledge's to solve engineering problems.

Course outcomes

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

1. The learn to estimate rainfall and perform hydrograph analysis.
2. Extract maximum amount of water from around aquifers after locating them.
3. Perform calculation for flood routing for various irrigation projects.

Course Content:

Unit I [9 hours]

Introduction : Definition and Uses of Engineering hydrology, Hydrologic cycle and water balance equations. Development of hydro-meteorological study in Nepal

Precipitation

Causes, forms and types of precipitation, Measurement of rainfall (types and adequacy of rain gauges), Snow fall and its measurements, Estimation of missing rainfall data, Test for inconsistencies of rainfall data (Double Mass Curve),Presentation of rainfall data (Mass curve, Hyetograph, Average curve of annual rainfall),Estimation of mean rainfall over an area, Development of Intensity - Duration - Frequency (IDF) curve and equation, Depth - Area - Duration (DAD) curve.

Unit II **[7 hours]**

Hydrological Losses

Initial losses (Interception and depression storage),Evaporation process,Meteorological parameters (Radiation, Temperature, Vapor pressure, Humidity, Wind), Energy Budget methods and Mass transfer approach (Dalton's law),Evaporimeters, Evapotranspiration ,Actual evapotranspiration and Lysimeters, Potential Evapotranspiration (Penman's equation),Infiltration:Horton's equation,Infiltration indices (Φ and W).Infiltrometers

Unit III **[7 hours]**

Surface Runoff

Drainage basins and its quantitative characteristics, Factors affecting runoff from a catchment, Rainfall - Runoff relationship, Stream gauging (selection of sites, types of gauges and measurement),Stream flow measurement by velocity area method (current meters, floats and velocity rods),Stream flow computation by slope area method, Development of Rating curve and its uses, Estimation of monthly flows from rainfall

Unit IV **[7 hours]**

Hydrograph Analysis

Components of a hydrograph, Separation of base flow,Unit hydrographs, their uses and limitations, Derivation of unit hydrographs from isolated and complex storms, Derivation of unit hydrographs of different durations

Unit V **[10 hours]**

Flood Hydrology

Design flood and its frequency, Statistical methods of flood prediction, Continuous Probability distribution, Return period, Frequency and risk, Plotting positions, frequency factors,Log Pearson III Method,Gumbel's Extreme Value Type I Method,Flood prediction by Rational and Empirical methods

Flow Routing

Introduction to Flood Routing, Linear Reservoir routing, Time area Method, Clark Unit hydrograph

Recommended Books and References:

1. Engineering Hydrology by K. Subramanya, Tata-McGraw Hill Publishing Co., New Delhi
2. Applied Hydrology by V.T. Chow, D.R. Midment and L.W. Mays, McGraw Hill International
3. Engineering Hydrology by R. S. Varshney, Nem Chand & Bros., Roorkee
4. Hydrology for Engineers by Linsley, Kohler and Paulhus, McGraw Hill International Co.
5. Engineering Hydrology by B. L. Gupta, Standard Publishers and Distributors, New Delhi.
6. Elementary Hydrology by V.P.Singh. Prentice Hal publication.

URBAN AND TOWN PLANNING(CET-014)

3L:0T:0P **Credit:3**

Course Objectives:

1. The course is intended to develop an appreciation of the scope and breadth of planning practice as it has emerged historically
2. Provide an overview of the various fields within planning, such as housing, community development, transportation, environmental planning, urban sprawl and growth management. Our focus will be on the major policy issues and problems within each of the fields.
3. This course is designed to explore the capacities for planners to work collaboratively inaddressing transportation and urban infrastructure challenges.

Course Outcomes:

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

.1. Get an overview and understanding of the History of Town Planning Politics and policy making in modern cities and to assess modern and contemporary theories of Town and Country Planning

2. develop ability to conduct transportation planning, analysis and evaluation of systems. They will learn short & long range planning for alternative transport systems while designing for present and future cities and regions.

3 build a depth understanding of spatial and non-spatial data collection, presentation and interpretation in context for physical planning.

Syllabus:

UNIT-I **(8 hours)**

Definition and classification of urban areas - Trend of urbanization - Planning process – Various stages of the planning process - Surveys in planning. Plans - Delineation of planning areas. utility of spaces, future growth etc. Role of "Urban Planner "in planning and designing in relation with spatial organization, utility, demand of the area and supply.

UNIT-II **(8 hours)**

Plan Implementation- Urban Planning agencies and their functions - Financing- Public, private, Nongovernmental organizations- Public participation in Planning. Development control regulations. Sustainability and rationality in planning, Components of sustainable urban and regional development, Emerging Concepts: Global City, inclusive city, Safe city, etc. City of the future, future of the city

UNIT-III **(8 hours)**

Town and country planning Act- Building bye-laws. Elements of City Planning, Zoning and land use, Housing. Introduction to landscaping, importance , objectives, principles, elements, Urban Planning standards Urban renewal for quality of life and livability

UNIT-IV **(8 hours)**

Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems. Legal Issues in Planning and Professional Practice, Concepts and contents related to

planning provision regarding property rights, Concept of Arbitration, State and Central government to deal with various matters concerning Town and Country Planning. Mechanism for preparation of DP: Land Acquisition Rehabilitation and Resettlement Act 2013.

UNIT-V **(8 hours)**

Types of Development plans: Master Plan, City Development Plan, Structure Plan, housing, land use, Water Supply & sanitation, etc., planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc).

Text Book:

1. Adib Kanafani. (1983). Transportation Demand Analysis. McGraw Hill Series in Transportation, Berkeley.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. McGraw Hill Book Company, New York.
3. John W. Dickey. (1975). Metropolitan Transportation Planning. McGraw Hill Book Company, New York.
4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.
5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.
6. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
7. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)

Reference books:

1. Relevant IRC Codes
2. Bruton M J (1981), “Introduction to transportation planning”, Hutchinson of London
3. Dickey J W (1980), “Metropolitan Transportation Planning”, Tata McGraw Hill
4. Principles of Transportation Engineering: P. Chakraborty and A. Das
5. Traffic Engineering and Transport Planning: L.R. Kadyali

SAFTY Management in Construction (CET 015)

3L:0T:0P **Credit:3**

COURSE OBJECTIVES

This course aims to make the students well-versed with the latest safety and health regulations and the Indian Standards applicable to the construction industry. At the end of this course, the students will be able to plan, assess, analyze and manage the hazardous construction project sites.

COURSE OUTCOMES

1. explain the theoretical foundation for the different methods and tools in use to identify, analyse and evaluate accident risks and remedial actions
2. choose and assess appropriate methods and tools for a systematic and efficient accident prevention work in industrial organisations and projects.
3. choose and assess efficient preventive measures and argue for the choice of these
4. explain why accidents happen by use of different theoretical models and perspectives
5. explain the principles for experience feedback and learning from unwanted occurrences.
6. relate safety management in different project phases to each other

SYLLABUSDETAILS:

Unit 1: (12 HOURS)

Construction Safety Management – Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.

Unit 2: (12 HOURS)

Safety in construction operations – Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction. Prevention of accidents. Safety measures. Safety in use of construction equipment e.g. vehicles, cranes, hoists and lifts etc. safety of scaffolding and working platforms. Safety while using electrical appliances. Explosives used.

Unit 3: (08 HOURS)

Various safety equipment and gear used on site. First aid on site, Safety awareness program. Labor laws, legal requirement and cost aspects of accidents on site, Incentive for safety practices.

Unit 4: (08 HOURS)

Study of safety policies, methods, equipment, training provided on any ISO approved construction Company, safety in office, working on sites of high rise construction, deep excavation

Reference Books

1. Construction safety manual published by National Safety Commission of India.

2. Safety Management in Construction Industry – A manual for project managers. NICMAR Mumbai.
3. Construction Safety Handbook – Davies V.S.Thomasin K, Thomas Telford, London.
4. ISI for safety in Construction – Bureau of Indian Standrads.
5. —Safety management‖ –Girimaldi and Simonds, AITBS, New Delhi

Reinforced Concrete Structure Lab. (CEP 009)

L: T: P: 0:0:02

COURSEOBJECTIVES:

1. Tostudyaboutmaterialsinvolvedinreinforcedconcretestructures.
2. Tostudyaboutthemethodsof reinforcedconcreteconstruction.
3. To study the behavior and design of reinforced concrete beams and one-way slabs consideringdeflections,flexure,shearand anchorage.

COURSE OUTCOMES:

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

1. Understand various reinforcement and their locations in Beam Design.
2. Understand various reinforcement and their locations in Column Design.
3. Differentiate between main and distribution reinforcement in slab design.
4. Understand various reinforcement and their locations in footing and retaining wall.
5. Acquire knowledge about various rolled section and different connections.
6. Explain about Gusset base design and detail
7. Identify various roof components and their position.
8. Learn Grillage foundation detailing

List of Experiments.

1. SinglyandDoublyreinforced rectangular&FlangedBeams.
2. Slabsspanninginonedirection,Slabsspanningintwodirections,Circularslabs.
3. Staircaseswithwaistslabhavingequalandunequalflightswithdifferentsupportconditions,Slab lesstread-riser staircase. Design ofstaircases.
4. Square,RectangularandCircularcolumns
5. Isolatedandcombinedfootings,Strapfooting.
6. Retainingwallsandbasementwalls

TEXT/REFERENCE BOOKS:

- Sham Ticko, 2015, Learning Bentley Staad.Pro V8I for Structural Analysis, Dreamtech Press.
- Handbook on Concrete Reinforcement and Detaling SP 34 (1987), Bureau of Indian Standards.
- Manual for Detaling of steel Structure by S. Kanthimathinathan.
- Structural Design and Drawing renforced concrete and Steel by N Krishna Raju, University Press.
- Practical Design of Reinforced Concrete Structures by Karuna Moy Ghosh, PHI publications.
- Handbook on Concrete Reinforcement and Detaling SP 34 (1987), Bureau of Indian Standards.

SOIL MECHANICS LAB (CEP-010)

0L:0T:2P

Course objectives:

1. Ability to evaluate various soil characteristics.
2. Ability to measure shear strength of soil.
3. Student will be familiar with ASTM laboratory test standards and procedures. This include preparing soil samples for testing, performing the test, collecting and analyzing data, interpreting the results and writing technical reports.

Course Outcomes:

After the completion of this course, the student will be able to:

1. Understand the procedure for classifying coarse grained and fine-grained soils.
2. Evaluate the index properties of soil.
3. Determine the engineering properties of soil.
4. Interpret the results of compaction test for relative compaction in the field
5. Conduct experiments analyze and interpret results for geotechnical engineering design.
6. Compute and analyze the consolidation settlements.

Syllabus:

LIST OF EXPERIMENTS:

1. Megascopic study: Igneous, Sedimentary, Metamorphic of Rocks.
2. Megascopic study of minerals.
3. Field identification of Fine-Grained soils.
4. Natural moisture content using Oven Drying method.
5. Specific gravity of Soils.
6. Grain size distribution by Sieve Analysis and Hydrometer Analysis.
7. Consistency limits by Liquid limit, Plastic limit and Shrinkage limit.
8. Field Density using Core Cutter method and Sand replacement method.
9. Relative density.
10. Permeability test using Constant-head test method.
11. Permeability test using Falling-head method.
12. Compaction test: Standard Proctor test and Modified Proctor test.
13. Consolidation Test.
14. Direct Shear Test.

Text Book:

1. Ranjan, G. and Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age International Publishers. 2007
2. Punmia, B. C., “Soil Mechanics and Foundations”, Laxmi Publications (P) LTD. 2017

Reference Books:

3. Das, B. M. (2021). Soil mechanics laboratory manual.
4. Ventura Tejeda, F. R. (2020). Soil Mechanics Laboratory Manual.
5. Kalinski, M. E. (2011). Soil mechanics: lab manual (No. Ed. 2). John Wiley & Sons

Civil Engineering Software Lab (CEP 011)

0L:0T:2P

Course objective: To learn various drafting software's used in civil engineering.

COURSE OUTCOMES:

At the end of the course, students will achieve following outcomes:

1. To creating object styles and labels description keys in AutoCAD Civil 3D.
2. To perform analysis by water, drop path, quick profiles and volume surfaces (cut and fill) AutoCAD Civil3D.
3. To perform alignment from objects, alignment by layout, alignments labels in AutoCAD Civil 3D.
4. To do laying out a storm sewer network creating a network by objects, by creation tools in AutoCADCivil 3D.

LIST OF PRACTICALS:

1. Introduction to Civil 3D interface (Application menu, Ribbon, Quick Access Toolbar, the tool space, drawingarea, Command Area, Status bar) and Creating Object Styles and Labels Description Keys, an easy way toprocess survey data.
2. Creating points from a Surface, from segment: divide object by Intervals: measure object and creating pointson an alignment, elevation from the surface finally exporting point.
3. Creating and defining surfaces by point groups, from break lines, surface Boundary, surface by Edits, andsurface from Contours.
4. Surface Properties, Analysis by Water Drop Path, Analysis by Quick Profiles, Volume Surfaces (Cut and Fill),Surface Styles and Labels, Surface Labels and Tables
5. Introduction to Parcel, Sites, Parcel from Objects, Parcel Creation Tools, Free Form Create, Parcel Adjustment,Parcel Cul-de-Sac Area, Parcel renumbering, Parcel Styles, Parcel Label Style.
6. Introduction to alignment, Alignment from objects, Alignment by Layout, Alignments Labels
7. Introduction to Profile, Profile from Surface, Profile by Layout, Profile Styles and Labels
8. Introduction to Corridor, Cross-section or Assembly, Corridor Creation,
9. Modifying a Corridor: Baselines, Corridor Frequencies, Corridor targets, splitting a corridor, Creating a corridor Surface
10. Laying out a Storm Sewer network, Pipe Rules, Pipe Parts List, creating a Network by objects, Creating a Network by Creation Tools, Projecting Pipesin Profiles

TEXT/REFERENCE BOOKS:

- Eric Chappell, 2016, AutoCAD Civil 3D 2016 Essentials, Autodesk Official Press, Sybex
- Davenport Cyndy, VoiculescuIshka, Mastering AutoCAD Civil 3D 2016: Autodesk Official Press.

CONSTITUTION OF INDIA (AHT-009)

L:T:P:: 2:0:0 **Credits-0**

COURSE OBJECTIVE:

1. To acquaint the students with legacies of constitutional development in India and help to understand the most diversified legal document of India and philosophy behind it.
2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3. To channelize students' thinking towards basic understanding of the legal concepts and its implications for engineers.

COURSE OUTCOMES

The course should enable the students to:

1. Understand the basic knowledge and salient features of Indian Constitution.
2. Identify and explore the basic features and modalities about Indian constitution.
3. Discusses the essence of Union and its territories, Citizenship, Fundamental Rights, DPSP and Fundamental Duties.
4. Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
5. Differentiate different aspects of Indian Legal System and its related bodies.

Unit-1 Constitutional Framework

Meaning of Terms and Phrases frequently used in political system like constitution, constitutionalism, Rule of Law, Federal system, Government and so on. Historical Background of Indian Constitution, Making of Indian Constitution, Salient features of Indian Constitution, Preamble of Indian Constitution.

Unit-2 Different Parts, Articles, and their significance

Part I to IVA (Union and its territories w.r.t. Indian States, Citizenship, Fundamental Rights conferred to citizens and foreigners, Directive Principles of State Policy– Its importance and implementation and Fundamental Duties and its legal status), Article 1 to 51A and their significance.

Unit-3 System of Government

Parliamentary Form of Government in India – The constitution powers and status of the President of India, Federal structure and distribution of legislative and financial powers between the Union and the States, Emergency Provisions: National Emergency, President Rule, Financial Emergency and Amendment of the Constitutional Powers and Procedure and the significance of basic structure in Indian Judicial system

Unit-4 Working of Central, State & Local Self Government as per constitution

Framework for central government (President, Vice president, Prime Minister, Central council of ministers, Parliament, Supreme court and so on), Framework for state government (Governor, Chief Minister, state legislature, High court and so on) and Framework for local self government (Panchayatiraj, Municipalities) and Union Territories.

Unit-5 Constitutional, Non-Constitutional and other bodies

Discussion on Various constitutional bodies like Election Commission, UPSC, SPSC, Finance commission, NCSC, NCST, NCBC, CAG and AGI. Discussion on Various non-constitutional bodies like NITI Aayog, NHRC, CIC, CVC, CBI, Lokpal and Lokayukta. Discussion on Various other constitutional bodies like Co-operative societies, Official Language, Tribunals etc.

Text/Reference books-

1. M. Laxmikanth, "Indian Polity", McGraw- Hill, 6th edition, 2020
2. D.D. Basu, "Introduction to the Indian Constitution", LexisNexis, 21st edition, 2020
3. S.C. Kashyap, " Constitution of India", Vitasta publishing Pvt. Ltd., 2019

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (AHT-010)

L:T:P:: 2:0:0 **Credits-0**

COURSE OBJECTIVES:

The course should enable the students to:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyse it and apply it to their day to day life.
3. To make the students know the need and importance of protecting traditional knowledge.
4. To make the students understand the concepts of Intellectual property to protect the traditional knowledge.
5. This course is also concentrating on various acts in protecting the environment and Knowledge management impact on various sectors in the economy development of the country.

COURSE OUTCOMES:

The course should enable the students to:

1. Understand the concept of Traditional knowledge and its importance.
2. Know the need and importance of protecting traditional knowledge.
3. Know the various enactments related to the protection of traditional knowledge.
4. Understand the concepts of Intellectual property to protect the traditional knowledge.
5. Know the contribution of scientists of different areas.

Unit – 1 Introduction to Traditional and Culture Knowledge

Define culture, traditional, civilization and heritage knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK). Indigenous traditional knowledge Vs western traditional knowledge vis-à-vis formal knowledge.

Unit-2 Protection of Traditional Knowledge

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of traditional knowledge Protection, value of traditional knowledge in global economy, Role of Government to harness traditional knowledge.

Unit – 3 Traditional Knowledge and Intellectual Property

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Global legal forums for increasing protection of Indian Traditional Knowledge.

Unit – 4 Traditional Knowledge in Different Sectors

Traditional knowledge in engineering, biotechnology and agriculture, traditional medicine system, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of

traditional knowledge.

Unit – 5 Education System in India

Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Value based Education.

Text/Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.
3. Traditional Knowledge System in India, by Amit Jha, 2009.
4. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
5. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh Pratibha Prakashan 2012.

TRAFFIC PLANNING AND MANAGEMENT (CET-037)

3L:0T:0P **Credit: 04**

Course Objectives: The objectives of this course are to impart knowledge and abilities the students to the fundamentals of urban transportation planning and the types of skills and knowledge that transportation planners need. It further familiarizes students with contemporary transportation planning issues and methods of analysis. The course is highly relevant regardless if students intend to focus on transportation itself, or other aspects of urban planning.

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

1. Identify urban transportation problems.
2. Estimate urban travel demand.
3. Plan urban transport networks.
4. Identify urban transport corridors.
5. Prepare urban transportation plans

Syllabus:

UNIT-I **(8 hours)**

Introduction: Role of transportation in the economic development of nations, overview of transport modes, growth trends, National Transport Policy of India – Case studies, transportation planning in the developing world; and comparative international transportation policies; Fundamentals of transportation , Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment

UNIT-II **(8 hours)**

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

UNIT-III **(8 hours)**

Travel Demand issues: Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques

UNIT-IV **(8 hours) Demand and supply planning :** Planning for sustainable urban mobility, positive and negative externalities in urban transport, congestion pricing, parking policy, demand management , Urban travel and transportation system characteristics – a systems perspective, Data management and use in decision making , Demand analysis , Urban activity analysis, Supply analysis; Plan Preparation And Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis

UNIT-V **(8 hours)**

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

Text Book:

1. Fred L. Mannering, Scott S. Washburn. Principles of Highway Engineering and Traffic Analysis.7th Edition, Wiley, 2019.
2. Kadiyali L.R. Traffic Engineering & Transport Planning. Khanna Publications, 2013.
3. Khisty C.J. and Lall B.K. Transportation Engineering – An Introduction. 3rd Edition, Pearson, 2017.

Reference Books:

- Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London Ltd.
- Introduction to Urban System Planning –B.G. Hutchinson; McGraw Hill.

AIR, WATER & NOISE POLLUTION AND CONTROL(CET-0 38)

3L:0T:0P **Credit: 04**

Course Objectives: To introduce the basics of Air and Noise Pollution and their mitigation measures

Course Outcomes:

On completion of the course, the student will :

1. Be able to understand the impact of air and noise on human's health and environment.
2. Be able to identify the sources of air and noise pollution.
3. Be able to plan strategies to control, reduce and monitor air and noise pollution.

Syllabus:

UNIT-I **(8 hours)**

Air pollutants, Sources, classification, Effects on Health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects, Smoke, smog and **ozone** layer disturbance, Greenhouse effect

UNIT-II **(8 hours)**

Air sampling and pollution measurement methods, principles and instruments, Indoor and ambient air quality and emission standards, Air pollution indices

UNIT-III **(8 hours)**

Air Act, legislation and regulations, control principles, Removal of gaseous pollutants by adsorption**,** absorption, reaction and other methods. Particulate emission control, settling chambers, cyclone separation.

UNIT-IV **(8 hours)**

Wet collectors, fabric filters, electrostatic precipitators and other removal methods like absorption, adsorption, precipitation, and biological air pollution control technologies

UNIT-V **(8 hours)**

Noise- Basic concept, noise monitoring procedure, specification and various control methods, effects of noise on Health

Text Book:

1. Kenneth, W., Warner, F.C. And Davis Wayne, T., "Air Pollution, Its Origin and Control", 3rd Ed., Prentice Hall.

2. Mishra, P.C., "Fundamentals of Air and Water pollution", South Asia Books**.**

Reference books:

1. Davis, M.L. and Cornwell, D.A., "Introduction to Environmental Engineering", McGraw Hill.

Basics of RemoteSensingandDigitalImageProcessing (CET-0 39)

3L:0T:0P **Credits-04**

Course Objectives: TointroducetheconceptsofRemoteSensingandDigitalImageProcessing.

Course Outcomes:

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

1. Identifies the various Remote Sensing components
2. Learn various software's used in remote Sensing
3. Analyse various Remote Sensing digital Images

Syllabus:

UNIT-I **(8 hours)**

Introduction: History of Remote Sensing, Remote sensing components, Sources of Energy, EMS and Radiation, Black body and associated laws Interaction of EMR with Atmosphere—Scattering, Refraction, Absorption, Transmission, Atmospheric windows, Interaction o fEMRwithEarthSurface—Spectralreflectancecurves,Radiation Calculation

UNIT-II **(10 hours)**

PlatformsandSensors:OrbitalmovementandEarthcoverage.Sunsynchronousand Geosynchronoussatellites,Activeandpassivesensors,PAN,MultiHighresolutionand Hyper spectral Sensors, Thermal and Microwave sensors, Sensors characteristics, Indian Remote Sensing Satellite Programme, Other satellites, HardcopyImages,Visualimageanalysis:Imageinterpretation:Elements,Keysand aids, Basicinstrumentation,Visualinterpretationofimages

UNIT-III **(6 hours)**

Image Processing software, Digital data products and their characteristics. Digital Image Formats. Colour image generation, Initial data statistics, Histogram and Scatter plot, Mosacing, Pre-processing:Atmospheric,RadiometricandGeometriccorrections

UNIT-IV **(8 hours)**

Image enhancement, Contrast stretching, Noise removal, Low and high pass filters, other filters. Edge detection, Texture images, RatioandNDVIImages,Tasseledcaptransformation,

UNIT-V **(8 hours)**

Digitalimageanalysis:Supervisedandunsupervisedimageclassificationmethods, Accuracyassessment, PCAanditsuses

Text Book:

1 Lillesand,T.M.andR.W.Kiefer,"RemoteSensingandImageInterpretation",4th Ed.,John Wiley.

2 Jain,A.K.,"FundamentalsofDigitalImageProcessing",PrenticeHall

Reference books:

1 Chandra, A.M. and Ghosh, S.K., "Remote Sensing and Geographical InformationSystem", Narosa.

Gonzales,R.C.andWoods,R.E.,"DigitalImageProcessing",2nd Ed.,Pearson Education.

TRANSPORTATION ENGINEERING (CET-016)

3L:1T:0P **Credit: 04**

Course Objectives: The aim of this course is to help the student to attain the following industry identified competency through various teaching learning process:

1. To learn about various materials to be used in Highway Pavements
2. To design the various types of Pavements
3. To learn about traffic and traffic related problems
4. To undertake Field problems of Highway pavements

Course Outcomes:

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

1. Carry out surveys involved in planning and highway alignment.
2. Design the geometric elements of highways and expressways.
3. Carry out traffic studies and implement traffic regulation and control measures and intersection design.
4. Characterize pavement materials.
5. Design flexible and rigid pavements as per Indian Roads Congress.

Syllabus:

UNIT-I **(8 hours)**

. **Highway development and planning-** Classification of roads, road development in India, Current Road projects in India; highway alignment and project preparation, road development plans, engineering surveys.

UNIT-II **(8 hours)**

Geometric design of highways- Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems.

UNIT-III **(8 hours)**

Traffic engineering & control- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems, intelligent transport systems

UNIT-IV **(8 hours)**

Pavement materials- Materials used in Highway Construction- Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements.

UNIT-V **(8 hours)**

Design of pavements- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC.

Text Book:

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
2. Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers
3. Partha Chakraborty, ' Principles of Transportation Engineering, PHI Learning
4. Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press

Reference books:

1. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski, 'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley 2011
2. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

Design of Steel Structure (CET017)

L: T: P::3:1:0 **Credits-4**

COURSEOBJECTIVES

1. Tointroducesteelstructuresanditsbasiccomponents.
2. To built concept of different design philosophies
3. Tointroducestructuralsteelfastenerslikeweldingandbolting.
4. Todesigntensionmembers,compressionmembers,beamsandbeam-columns.
5. Todesigncolumnsplicesandbases.

COURSEOUTCOMES(COs)

1. Identifyandcomputethedesignloadsonatypicalsteelbuilding.
2. Abletoidentifyandinterprettheappropriaterelevantindustrydesigncodes.
3. Identifythedifferentfailuremodesofsteeltensionandcompressionmembersandbeams,an dcompute their design strengths.
4. Students willbeableto checkandspecify theserviceability requirements of thedesignedsteelstructures.
5. Identifythedifferentfailuremodesofboltedandweldedconnections,anddeterminetheirde signstrengths.

SYLLABUSDETAILS:

UnitI:(8)

INTRODUCTION: Properties of steel – Structural steel sections – Limit State Design Concepts –Loads on Structures – Metal joining methods using rivets, welding, bolting– Design of bolted,rivetedandweldedjoints– Eccentricconnections-Efficiencyofjoints–High Tensionbolts.

UnitII:(8)

TENSION MEMBERS: Types of sections – Net area – Net effective sections for angles and Tee intension – Design of connections in tension members – Use of lug angles – Design of tension splice –Conceptofshear lag.

UnitIII:(8)

COMPRESSION MEMBERS: Types of compression members – Theory of columns – Basis ofcurrent codal provision for compression member design– Slenderness ratio – Design of singlesectionandcompoundsectioncompressionmembers– Designoflacingandbatteningtypecolumns – Designofcolumnbases–Gussetedbase,Slabbase.

UnitIV:(8)

BEAMS: Design of laterally supported and unsupported beams – Built up beams – Beams subjectedtobiaxialbending–Designofplategirdersrivetedandwelded– Intermediateandbearingstiffeners – Websplices.

Unit V: **(8)**

ROOFTRUSSESANDINDUSTRIALSTRUCTURES: ElementsofRooftrusses–Roofandsidecoverings– Design loads, design ofpurlin.

Note:designstobedonebothbyWorkingstressandLimitstatemethods

ReferenceBooks:-

1. IS800-2007IndianStandard -General ConstructioninSteel–codeofpractice(3rdRevision).
2. SKDuggal"LimitStateDesignofSteelStructures"TataMcGraw-HillEducation,1stEdition,TMHPublication, 2011.
3. N.Subramaniyan,"DesignofSteelstructures",1stEdition,Oxforduniversitypress,2008.
4. Ramachandra,S.andVirendraGehlot,"DesignofSteelStructures–Vol.I&II",StandardPublication,New Delhi, 2007.
5. Bhavikatti,S.S.(2010).DesignofSteelStructures(byLimitStateMethodasPerIS:800-2007),IKInternational.

Environmental Engineering(CET018)

L:T:P:: 3:1:0 Credits-4

COURSE OBJECTIVES:

1. To educate the students on the principles water supply.
2. Develop an understanding of the characteristics of water that must be considered during design of a treatment plant.
3. Develop understanding of events governing the rural/urban water supply.

COURSE OUTCOMES:

After successfully studying this course, students will:

1. Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil.
2. Be able to plan strategies to control, reduce and monitor air and water pollution.
3. Be able to select the most appropriate technique for the treatment of water.
4. Be able to design various treatment units for water treatment.
5. Apply sampling techniques for water, air and noise.

SYLLABUS:

Unit- I **(8 hours)**

Water: -Sources of water supply and quality issues, water quality requirement for different beneficial uses, Water quality standards, Water Supply systems, need for planned water supply schemes, types of water demand and population forecasts.

Unit- II **(8 hours)**

Water Treatment: Aeration, sedimentation, coagulation, flocculation, filtration, disinfection, advanced treatment processes.

Unit- III **(8 hours)**

Components of water supply system: Transmission of water, distribution system, water pipes, water supply system in building, plumbing and various valves used in W/S systems, service reservoirs and design.

Unit- IV **(8 hours)**

Water pollution : cause and ill effects, Noise- Basic concept, measurement, specification and various control methods, effects of noise on health.

Unit- V **(8 hours)**

Composition and properties of air: Quantification of air pollutants, Monitoring of air pollutants, Air pollution-Occupational hazards, Urban air pollution, automobile pollution. Air quality standards, Control measures for Air pollution (Gravitational Settling Chambers, cyclones, scrubbers, electrostatic precipitators filters).

TEXT BOOKS:

1. Water Supply Engineering By Santosh Kumar Garg Environmental Engineering (Vol. I).
2. Sewage Waste Disposal and Air Pollution Engineering By Santosh Kumar Garg (Environmental Engineering Vol.II).
3. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
4. Introduction to Environmental Engineering by P. AarneVesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
5. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.
6. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.

REFERENCE BOOKS:

1. Manual on Water Supply and Treatment. Ministry of Urban Development,New Delhi
2. Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999.

FOUNDATION ENGINEERING (CET-019)

3L:0T:0P **Credits: 03**

Course Objectives: Students will learn how to design shallow and deep foundations, retaining walls and slopes. And Student will learn how to utilize their knowledge in soil mechanics to perform various types of engineering calculations. This includes consolidation analysis for foundations and stability analysis of slopes and retaining walls.

Course Outcomes:

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

1. Determine the earth pressures on foundations and retaining structures.
2. Analyze shallow and deep foundations.
3. Calculate the bearing capacity of soils and foundation settlements.
4. Understand soil exploration methods.
5. Design machine foundation.

Syllabus:

UNIT-I **(8 hours)**

Earth Pressure and Retaining Walls: Earth pressure at rest, active and passive earth pressure, Rankine and Coulomb's earth pressure theories, earth pressure due to surcharge, retaining walls, stability analysis of retaining walls, proportioning and design of retaining walls.

UNIT-II **(8 hours)**

Stability of Slopes: Modes of failure-mechanism, stability analysis of infinite slopes, methods of slices, Bishop's simplified method.

UNIT-III **(8 hours)**

Foundations: Types of foundations, mechanism of load transfers in shallow and deep foundations, shallow foundations, Terzaghi's bearing capacity theory, computation of bearing capacity, effect of various factors, use of field test data in design of shallow foundations, stresses below the foundations, settlement of footings and rafts, proportioning of footings and rafts, sheeting and bracing of foundation excavation.

UNIT-IV **(8 hours)**

Pile Foundation: Types and methods of construction, estimation of pile capacity, capacity and settlement of group of piles, proportioning of piles.

Well foundations: Methods of construction, tilt and shift, remedial measures, bearing capacity, settlement and lateral stability of well foundation.

UNIT-V **(8 hours)**

Soil ExplorationTechnequics: Methods of soil exploration; boring, sampling, penetration tests, correlations between penetration resistance and soil design parameters.

Machine Foundations: Types of machine foundations, mathematical models, response of foundation - soil system to machine excitation, cyclic plate load test, block resonance test, criteria for design.

Text Book:

1. Das, B.M., "Principles of Foundation Engineering", PWS. 2004
2. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, new Delhi. 2002
3. Punmia, B. C., "Soil Mechanics and Foundations", Laxmi Publications (P) LTD. 2017

4, Murthy, V.N.S., "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers. 2007

Reference books:

Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers. 2007

Cost Effective and Eco Friendly Structures (CET020)

L: T: P::3:0:0 **Credits-3**

COURSEOBJECTIVES

1. Tounderstandtheenvironmentalissuesduetobuildingmaterialsandtheenergyconsumptioni nmanufacturingbuildingmaterials
2. Tostudythecosteffectiveconstructiontechniquesandequipment's
3. Tostudyhowtomakesanitationcosteffective
4. Tostudyhowtomakeroad constructioneco-friendly
5. TounderstandtheGreenbuildingratingsystem

COURSEOUTCOMES

Uponcompletionofthecoursethestudentshouldbeableto:

1. UnderstandtheDefinition,Concept&Objectivesofthetermscosteffectiveconstruction
2. Applycosteffectivetechniquesinconstruction
3. ApplycosteffectiveTechnologiesandMethodsinConstruction
4. StatetheConceptofGreenBuilding
5. Applylowcost and eco-friendlyroad constructiontechniques

SYLLABUSDETAILS:

Unit-I

Conceptsofenergyefficient&environmentfriendlymaterialsandtechniques.Costeffectivema terials: - Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, AlternateWood, Polymer. Energy Efficient & Environment friendly building material products: - Walls -Stabilised andsundried, soilblocks & bricks,Solid& Hollow concrete blocks,stonemasonryblocks, Ferrocement partitions. Roofs- Precast R.C. Plank & Joists roof,precast channel roof,Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, SeasalFibre roof,Improvedcountrytiles, Thatchroof, M.C.R. tile.

Unit-II

Costeffectiveconstructiontechniquesandequipments:-(a)Techniques:-
Rattrapbondconstruction, Energy Efficient roofings, Ferrocement technique, Mud Technology. (b) Equipment's: -Brick moulding machine, Stablilised soil block making machine and plants for the manufacturing ofconcrete blocks, M.C.R. tile making machine, Ferrocement wall panel & Roofing channel makingmachine,R.C.C. Chaukhat makingm/c.

Unit-III

Cost effective sanitation: - (a) Waste water disposal system (b) Cost effective sanitation for rural andurbanareas(c) Ferrocement Drains

Unit-IV

LowCostRoadConstruction:-
Costeffectiveroadmaterials,stabilization,constructiontechniquestests,equipment usedforconstruction,

drainage, maintenance.

UNIT-V

Cost analysis and comparison: - (a) All experimental materials (b) All experimental techniques GreenBuildingratingsystems

Referencebooks:-

1. AlternativeBuildingMaterialsandTechnologies– KSJagadeesh,BVVenkattaRamaReddy&KSNanjundaRao– NewAgeInternationalPublishers
2. IntegratedLifeCycleDesignofStructures–AskoSarja–CRCPress
3. Non-conventionalEnergyResources–DSChauhanandSKSreevasthava– NewAgeInternationalPublishers
4. BuildingsHowtoReduceCost –LaurieBacker -CostFord
5. Lynne Elizabeth, Cassandra Adams Alternative Construction:
6. Contemporary Natural Building Methods", Softcover,Wiley&SonsAustralia, Limited,John,2005
7. Givoni,"Man,Climate,Architecture,VanNostrand,NewYork,1976.
8. CharlesJ.Kibert,SustainableConstruction:GreenBuildingDesignandDelivery,JohnWiley&Sons,2005.
9. EugeneEccli-LowCost,Energyefficientshelterforowner&builder,RodalePress, 1976

STRUCTURAL HEALTH MONITORING (CET-021)

3L:0T:0P **Credits-3**

Course Objectives: The objectives of this course are to impart knowledge and abilities the students to assess the post construction condition of old and existing structure.

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

1. Diagnosis the distress in the structure understanding the causes and factors.
2. Assess the health of structure using static field methods.
3. Assess the health of structure using dynamic field tests.
4. Suggest repairs and rehabilitation measures of the structure

Syllabus:

UNIT-I **(08 hours)**

Structural Health:
Factors affecting Health of Structures, Causes of Distress, Regular Maintenance. Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration

UNIT-II **(08 hours)**

Structural Audit
Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT-III **(08 hours)**

Static Field Testing
Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement

UNIT-IV **(08 hours)**

DynamicFieldTesting
Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT-V **(08 hours)**

Introduction to Repairs and Rehabilitations of Structures:
Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique

TEXTBOOKS/REFERENCES:

1. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.
2. Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.
3. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
4. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc,

Open Elective
TOTAL QUALITY MANAGEMENT (AHT-011)

L:T:P:: 3:0:0 **Credits-3**

Course Objective

The course should enable the students to:

1. To understand the concept of Quality in Manufacturing and Service units.
2. To understand the Implication of Quality in Business.
3. To understand the Organization Structure in TQM.
4. To understand how to implement Quality Programs in an Organization.
5. To have exposure to challenges in Quality Improvement Programs.

Course Outcomes

Upon successful completion of the course, the student will be able to:

1. Identify the significance of quality in an organization.
2.Describe how to manage quality improvement teams.
3. Describe how to organize management and quality policies in TQM.
4. Apply the tools of quality improvement programs in an organization.
5. Assess the benefits of implementing TQM Program in an organization.

Unit	Course Content	Lectures
I	**Introduction:** Evolution of Quality, Historical Perspectives, Relationship among Quality, Vision, Mission and Objectives of an Organization, Role of Quality in a Corporate Structure of an Organization, Attributes of Product and Service Quality, Quality Characteristics: Quality of Design, Quality of Performance and Quality of Conformance, Zero Defect and Continuous Improvement.	07
II	**Conceptualization of TQM:** Introduction to Total Quality Management (TQM), Barriers to TQM, Benefits of TQM implementation, Basic Approaches of TQM, TQM Models, Quality Information System and Planning. Importance of TQM in manufacturing and Service Industry.	07
III	**Organization Structure in TQM:** Role of Top Management, Quality Council, Quality Circles, Organization Structure for Quality Circles, Quality Policies, Role of Middle and Lower Management, Problem Solving Techniques.	07
IV	**Tools and Systems for Quality Management:** Basic Tools: Cause & Effect Diagram, Flow Diagrams, Trend Charts, Histogram, Scatter Diagram, Control Chart, Advanced Tools: Affinity Diagram, Inter Relationship Diagram, Tree Diagram, Matrix Diagram, Process Decision Program Chart (PDPC) and Matrix Data Analysis, Fault Tree Analysis, Quality Function Deployment (QFD) Definition and Phases in QFD. Taguchi Approach To Quality System Design, Six - sigma Definition & Implementation Steps, Just In Time Production System, Quality Production through JIT and Kanban, Failure Mode and Effect Analysis (FMEA): Scope, Mode, Illustrative Example and Applications.	10
V	**Quality Assurance:** Causes of Quality Failure, Quality Assurance: Need and Various Elements in Quality Assurance Programme, Quality Control- on Line and off Line, Statistical Concepts in Quality, Chance and Assignable Causes, Bench Making in Quality Management. Implementation and Need of ISO 9000: ISO 9000 - 2000 Quality System: Elements, Registration, Documentation, Implemental Steps, Quality Audit, Product and Process Audit Scope, Steps and Benefits.	09

Books and References

1. Total Quality Management by Dale H Bersterfilled, PHI Publication.
2. Total Quality Management by N.V.R Naidu, G. Rajendra, New Age international Publication.
3. Total Quality Management by L. Sugandhi and Samuel Anand, PHI Publication.
4. Total Quality Management by R.S Naagarazan, New Age International Publication.

Open Elective

MANAGING E-COMMERCE AND DIGITAL COMMUNICATION(AHT-012)

L:T:P:: 3:0:0 **Credits-3**

Objective of the Course

The course should enable the students to:

1. To understand of concepts and techniques of internet marketing.
2. To study behaviour and experience of online customer.
3. To study the various techniques of digital promotion.
4. To find out the opportunities for marketers on digital platform.
5. To understand the role of several e commerce models in customer value creation.

Course Outcomes

Upon successful completion of the course, the student will be able to :

1. Understand strategies used in digital marketing.
2. Apply interactive marketing communications to gratify online buyer.
3. Apply digital promotion techniques for marketing of product and services.
4. Evaluate the role of web analytics in social media marketing.
5. Apply and design various e commerce models for e-business.

Unit	Course Content	Lectures
I	**Introduction to digital marketing:** Digital marketing meaning scope and importance, Internet versus traditional marketing. Use of business to consumer and business to internet marketing, internet marketing strategy, Incorporating self-service technologies (SSTs).	08
II	**Online buyer behaviour and models:** marketing mix in online context. Managing online customer experience, planning website design, understanding site user requirement, site design and structure, integrated marketing communications (IIMC), measurement of interactive marketing communication, e-WOM.	08
III	**Digital promotion techniques:** email marketing, strategy to craft email marketing campaign, permission marketing, viral marketing, blogs, search engines marketing (SEM), Search engine optimization, content marketing.	08
IV	**Social media marketing:** designing content for social media marketing, mobile marketing advertising on mobile devices, mobile apps, tracking mobile marketing performance, and introduction to web analytics-meaning types, key metrics and tools.	08
V	**Introduction to e-Commerce and Retailing in Online Space:** advantages of e-Commerce Platforms, Differentiate Show-rooming and Web-rooming, e-tailing, e-Commerce Business Process, Business Models, Interpret e-Commerce Shopping Cart Software & Other Factors of e-Commerce based business, role of aggregators in e-Commerce business.	08

Books and References

1. Kotler, P. and Keller, K.L. (2017) Marketing Management. 15 ° ed . India: Pearson Education .
2. Chaffey, D. and Ellis - Chadwick, F. (2012) . Digital Marketing Strategy. Implementation and Practice. 1st ed. Education
3. Digital Marketing: Cases from India by Rajendra Nargundkar and RomiSainy, Notion Press, Inc.

4. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation by Damian Rya Publisher.
5. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler, Publisher Wiley.

Open Elective

INDUSTRIAL SAFETY AND HAZARD MANAGEMENT(AHT-013)

L:T:P: 3:0:0 **3 Credits**

Course Objective

The course should enable the students to:

1. To impart knowledge about various aspects of industrial safety and occupational health.
2. To impart knowledge aboutOccupational Health and Toxicology.
3. To enable the students to identity hazard and assess risk.
4. To understand Acts and Rules of industrial safety and hazard management.
5. To teach about various safety acts and rules along with safety education and training.

Course Outcomes

Upon successful completion of the course, the student will be able to:

1. Identify the key aspects of industrial safety and mitigating them.
2. Describe various types of solution to problems arising in safety operations and hygiene.
3.Apply principles of OSHA in controlling industrial disasters and losses.
4. Identify various Acts and Rules of industrial safety and hazard management.
5. Assess the overall performance of safety protocols of chemical industries and hazard management.

Unit	Course Content	Lectures
I	**Concepts and Techniques:** History of safety movement -Evolution of modern safety concept - Incident Recall Technique (IRT), disaster control, safety analysis, safety survey,safety inspection, safety sampling. Safety Audits - components of safety audit, types of audit,audit methodology, non - conformity reporting (NCR), audit checklist- identification of unsafe acts of workers and unsafe conditions in the industry.	08
II	**Occupational Health and Toxicology:** Concept and spectrum of health, functional units and activities of occupational health services, occupational related diseases and levels of prevention of diseases. Toxicology- local, systemic and chronic effects, temporary and cumulative effects, carcinogens entry into human systems.	08
III	**Hazard Identification and Risk Assessment:** The process of risk management, hazard identification, evaluation (risk assessment, risk matrix), risk control implementation, action and recommendation.	08
IV	**Acts and Rules**: Indian boiler Act 1923, static and mobile pressure vessel rules (SMPV). motor vehicle rules, mines act 1952, workman compensation act, rules - electricity act and rules - hazardous wastes (management and handing) rules, 1989, with amendments in 2000 the building and other construction workers act 1996, Petroleum rules, Explosives Act 1963 Pesticides Act. Factories Act 1948 Air Act 1981 and Water Act 1974.	08
V	**Safety Education and Training:** importance of training - identification of training needs training methods - programmes, seminars, conferences, competitions - method of promoting sale practice motivation communication - role of government agencies and private consulting agencies in safety training creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign - domestic Safety and Training.	08

Books and References

1. Industrial Accident Prevention by H.W Heinrich, McGraw - Hi 1980.
2. Safety Management in industry by NV. Krishnan, Jaico Publishing House, Bombay, 1997.
3. Loss Prevention in Process Industries by FP Lees, Butterworth London, 1990.
4. Safety at Work by J.R. Ridey Butterwort London 1983.

TRANSPORTATION ENGINEERING LAB(CEP-013)
0L:0T:2P

Course objectives: Objectives of this course is: to learn various methods of testing of various materials used in different layers of Highway Pavements

Course Outcomes:

After the completion of this course, the student will be able to:

1. Understand the importance of these highway materials in construction of road.
2. Identify engineering properties of aggregate.
3. Identify the grade & properties of bitumen.

Syllabus:

LIST OF EXPERIMENTS:

1. Shape test (flakiness and elongation) of aggregate
2. Impact value test of aggregate
3. Crushing strength test of aggregate
4. Abrasion test of aggregate
5. Specific gravity test of bitumen
6. Ductility test of bitumen
7. Flush point and fire point test of bitumen
8. Float test of bitumen
9. Penetration test of bitumen
10. Softening test of bitumen
11. Viscosity test of bitumen
12. Water content test of bitumen
13. Marshal test for stability and flow value

Text Book:

1. Khanna, S. K., & Justo, C. E. G. (1971). *Highway Material Testing: Laboratory Manual*. Nem Chand
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017

Reference Books:

1. Kadiyali, L. R. (2017). *Highway Engineering*. KHANNA PUBLISHING HOUSE

Steel Structure Lab. (CEP 014)
L: T: P::0:0:2

CourseObjectives: Tointroducesteelstructuresanditsbasiccomponents with structuralsteelfastenerslikeweldingandbolting and Todesigntensionmembers,compressionmembers,beamsandbeam-columns and columnsplicesandbases.

Course Outcomes:

After the completion of this course, the student will be able to:

1. Identifyandcomputethedesignloadsonatypicalsteelbuilding.
2. Identifythedifferentfailuremodesofsteeltensionandcompressionmembersandbeams,andcompute their design strengths.
3. Students willbeableto checkandspecify theserviceability requirements of thedesignedsteelstructures.
4. Identifythedifferentfailuremodesofboltedandweldedconnections,anddeterminetheirdesignstrengths.

LIST OF EXPERIMENT

1. Structuralsteelsections
2. Simpleconnection
3. Eccentricconnections
4. Connectionsintensionmembers
5. Lacingandbatteningtypecolumns
6. Columnbases –Gussetedbase,Slabbase.
7. SteelTruss

Text Book:

1. IS800-2007IndianStandard -General ConstructioninSteel–codeofpractice(3rdRevision).
2. SKDuggal"LimitStateDesignofSteelStructures"TataMcGraw-HillEducation,1stEdition,TMHPublication, 2011.
3. N.Subramaniyan,"DesignofSteelstructures",1stEdition,Oxforduniversitypress,2008.

Reference Books:

4. Ramachandra,S.andVirendraGehlot,"DesignofSteelStructures–Vol.I&II",StandardPublication,New Delhi, 2007.
5. Bhavikatti,S.S.(2010).DesignofSteelStructures(byLimitStateMethodasPerIS:800-2007),IKInternational.

Environmental Engineering Lab (CEP015)

L:T:P:: 0:0:2 **Credits-1**

COURSE OBJECTIVES:

1. To learn different methods of water & waste water quality.
2. To conduct experiments to determine the concentrations of water and waste water.
3. To determine the degree and type of treatment.
4. To understand the environmental significance and application in environmental engineering practice.
5. To learn different methods of air pollution monitoring.

COURSE OUTCOMES:

At the end of the course, students will achieve following outcomes:

1. The students at the end of the experimental exercise would be able to perform field-oriented testing of water, Air and Noise.
2. The students would be knowledgeable to perform toxicity test.
3. The students would be able to observe and identify the Bacteriological quality of water.

LIST OF PRACTICALS:

1. Measurement of pH of water/wastewater samples.
2. Determination of Turbidity of water samples.
3. Determination of Electrical conductivity water samples.
4. Determination of Total dissolved solids in water samples.
5. Determination of Chlorides in water.
6. Determination of Iron in water samples.
7. Determination of Fluoride in water samples.
8. Determination of Alkalinity and acidity in water samples.
9. Determination of hardness of water samples.
10. Ambient Air quality monitoring (RSPM)
11. Ambient noise measurement.
12. Determination of optimum coagulant dosage.

TEXT BOOKS:

1. APHA, "Standard Methods for the Examination of Water and Wastewater", 21st Ed. Washington, 2005.
2. "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist, H. – Second Edition, VCH, Germany, 1992.

REFERENCE BOOKS:

1. "Methods of air sampling & analysis", James P.Lodge Jr(Editor) 3rd Edition, Lewis publishers,Inc,USA,1989.

MACHINE FOUDATION(CET-040)

3L:0T:0P **Credits: 04**

Course Objectives: To learn the Basic idea of design of Machine Foundation.

Course Outcomes:

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

1. Understand the dynamic behaviourof foundations.
2. Select foundation for dynamic loading.
3. Design machine foundations

Syllabus:

UNIT-I **(6 hours)**

Introduction to vibration problems, Undamped and Damped free vibration with viscous damping, Forced vibrations

UNIT-II **(8 hours)**

Introduction**:** Various types of machine foundations; Permissible amplitudes of vibrations, factors affecting the resonant frequency and amplitudes of vibrations; Estimation of damping and plastic coefficients.

UNIT-III **(8 hours)**

Foundations under Reciprocating Machine: Resonant frequency of the block foundations; Weightless spring and weighted spring method, Elastic half space method, miscellaneous methods; Behaviourand design of block foundations, permissible amplitudes

UNIT-IV **(8 hours)**

Hammer Foundations: Hammer foundations, classification, natural frequencies and amplitudes of foundationvibrations; Design principles, permissible amplitudes.

Framed Foundations: Framed foundations, their advantage for high-speed machines; Permissible amplitudes, design principles

UNIT-V **(10 hours)**

Vibration Isolation and Screening: Methods of decreasing vibrations on existing foundations; Isolation of vibrations; Screening of vibrations.

IS Code of Practice: Critical review of IS code provisions for design of machine foundations.

Structural Design: General principles of design; Construction aspects; Case histories of failures of machine foundations

Text Book:

1. Handbook of Machine Foundations by P. Srinivasulu and G.V. Vaidyanathan, **Tata** McGraw Hill.
2. Dynamics of Bases and Foundations by Barken, McGraw Hill Publishing Co., New York

Reference books:

1. 1. Soil Dynamics by Shamsher Prakash.

Environmental Impact Assessment Techniques (CET041)

L:T:P:: 3:0:0 **Credits-3**

Course Objectives:

The objectives of the course are to

1. Define and Classify Environmental Impacts and the terminology
2. Understands the environmental Impact assessment procedure
3. Explain the EIA methodology
4. List and describe environmental audits

COURSE OUTCOMES: After the completion of this course, the student will be able to:

1. Identify the various technique of EIA
2. Explicate the concept of EIA
3. Illustrate the necessity of public participation in EIA studies
4. Summarize the importance of Environmental Attributes
5. Explain the phenomena of Impacts on environment
6. Quantify impacts for various developmental projects

Syllabus

UNIT-I **(8 hours)**

Concepts of Environmental Impact Assessment: Environment; Environmental Impacts; Environmental Impact Analysis; Environmental Impact Assessment and Environmental Impact Statement; EIA- As An Integral Part of The Planning Process.

UNIT-II **(8 hours)**

Detailed Contents of EIA: Introduction; Project Description; Description of The Environment; Anticipated Environmental Impacts And Mitigation Measures: Analysis of Alternatives; Environmental Monitoring Programme; Additional studies; Project Benefits; Environmental Cost Benefit Analysis.

UNIT-III **(8 hours)**

Environment attributes: air; water; noise; land and soil. Description of the Baseline Environment: Purposes for defining the Environmental Setting; Selection of parameters, Monitoring of physical environmental parameters, Collection and interpretation of baseline data for various environmental attributes.

UNIT-IV **(8 hours)**

Prediction and Methods of Assessment of Impacts on Various aspects of Environment; Application of various models for the Prediction of impact on Air Environment, Water Environment, Noise Environment

and Land.

UNIT-V **(8 hours)**

EIA notification September 2006 and amendments: Categorization of projects, Procedure for getting environmental clearance. Public participation in environmental decision making process. Case studies on EIA for Infrastructure projects.

Text Books:

1. Environmental Impact Analysis Handbook – by Rau Whooten; McGraw Hill publications
2. Environmental Impact Assessment – by Larry Canter; McGraw Hill publications
3. Environmental Impact Analysis – A Decision Making Tool by R K Jain
4. Handbook of Environment Impact Assessment by Judith Petts; McGraw Hill publications

Reference Books:

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.

Basics ofAnalyticalandDigitalPhotogrammetry (CET-0 42)

3L:0T:0P **Credits-04**

Course Objectives: Toprovideenhancedknowledgeonanalyticaland Digital Photogrammetry

Course Outcomes:

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

1. Evaluate the Digital photographs for various design requirements
2. Calculate the image coordinates from photographs
3. Find out the digital correlation from photographs

Syllabus:

UNIT-I **(8 hours)**

Introduction,Historicaldevelopmentfromconventionaltoanalyticalanddigital photogrammetry,Applicationsofanalyticalanddigitalphotogrammetry, Coordinatesystems,Conditionequations, Orthogonaltransformationmatricesand methodsofconstruction,Approximateorthogonalmatrix,Measurementofimagecoordinates from hard copy and soft copy; Instruments

UNIT-II **(8 hours)**

Digital images andtheir properties, Direct and indirect methods of acquisition of digital images-CCD,Digitizersandphotogrammetricscanners,Comparativemerits,Storage andcompressionofdigitalimagery,Lossofdata&imagequality, Analyticalorientation,Relative,AbsoluteandExteriororientationmethods,Analytical plotter and its functioning, Automatic image matching techniques - signal based and feature based matching.

UNIT-III **(8 hours)**

Digitalcorrelation,Leastsquarematching,Multipointmatchingetc.,Modelformation usingdigitalstereopairs,AutomaticgenerationofDEM,Digitalorthophotos

UNIT-IV **(6 hours)**

Digitalphotogrammetricsystem-Potential,Capabilitiesandcharacteristicsfeatures, Designconsideration,Add-ondevices

UNIT-V **(10 hours)**

Analytical aerial triangulation,Independent modeltriangulation,Stripandblock triangulationandadjustment,Bundleblockadjustment.Variousapplications

Text Book:

1. Ghosh,SanjibK.,"AnalyticalPhotogrammetry",ConceptPublishing Co.
2. Linder,Wilfried,"DigitalPhgotogrammetry",Springer.

Reference books:

1. Egals,YvesandKasser,Michel,"DigitalPhotogrammetry",Taylorand Francis.
2. ManualofPhotogrammetry",AmericanSocietyofPhotogrammetry.

IntroductiontoEnvironmentalEngineering (CET-0 43)

3L:0T:0P **Credits-04**

Course Objectives: Tointroducefundamentalsofenvironmental Engineering

Course Outcomes:

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

1. Know about various environmental issues
2. Gain knowledge about water – soil interaction
3. Gain about Landpollutionandsolidwastemanagement

Syllabus:

UNIT-I **(8 hours)**

Overview: Environment and Natural Processes; Development (ResourceUtilization&WasteGeneration);Environmentalissues;ConceptofSustainableDevelopment;Issuesaffectingfuturedevelopment(population, urbanization, health, water scarcity, energy, climate change,toxicchemicals,finiteresourcesetc.);Environmentalunits

UNIT-II **(8 hours)**

Water–SoilInteraction:CarbonateSystem (Alkalinity andbufferingcapacity); Major ions in water; Natural Organic Matter (NOMs); Waterquality parameters; Physical processes (Mass Balance): Spatio-temporalvariationinqualityofriverwater,lakewater,groundwater;Waterqualitystandards

UNIT-III **(8 hours)**

Air resources: Atmosphere; Air pollutants; Emissions and control of airpollutants; Atmospheric meteorology and dispersion; Transport of air(global,regional,local);Air/atmosphericstability;Plumeshape;Gaussianmodeling;Airqualitystandards

UNIT-IV **(8 hours)**

Air–Waterinteraction , Wetlands,watertreatmentandwastewatertreatment, Landpollutionandsolidwastemanagement

UNIT-V **(8 hours)**

Ecosystem: Structure and function; Energy flow in ecosystem; Materialflow in ecosystem; Biodiversity and ecosystem health; Bio-amplificationandbio-magnification, HazardousWaste:Definition;Classification;Storageandmanagement;Siteremediation; EnvironmentalRisk: assessment,andmanagement

Text Book:

1. MastersG.M.,JosephK.andNagendranR."IntroductiontoEnvironmentalEngineeringandScience",PearsonEducation,New Delhi.
2. MiheicicJ.R.andZimmermanJ.B."EnvironmentalEngineering:Fundamentals,Sustainability,Design"John WileyandSons, Inc

Reference books:

1. DavisM.L.andCornwellD.A.,"IntroductiontoEnvironmentalEngineering",McGrawHill,NewYork

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICALUNIVERSITY
(Formerly Uttarakhand Technical University, Dehradun Established by Uttarakhand State Govt. wide Act no. 415 of 2005)
Suddhowala, PO-Chandanwadi, Premnagar, Dehradun, Uttarakhand (Website- www.uktech.ac.in)

SYLLABUS

For

B.TECH
(Civil Engineering)
4TH Year

Effective From – Session 2025-26

EFFECTIVE FROM 2025-26

B.Tech. (CIVIL ENGINEERING) (w.e.f. 2025-26)													
SEMESTER-VII													
Sl. No.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	AHT-015/ AHT-016	HSC	HSMC -1 / HSMC-2	3	0	0	30	20	50	100		150	3
2	CET-022-024	DE	Departmental Elective-4	3	0	0	30	20	50	100		150	3
3	CET-025-027	DE	Departmental Elective-5	3	0	0	30	20	50	100		150	3
4		OE	Open Elective-2 (Course offered from other Branch)	3	0	0	30	20	50	100		150	3
5	CEP-017	DLC	Project Seminar	0	0	2			50			50	1
6	CEP-018	DLC	Design Project	0	0	4			100			100	2
7	CEP-019	DLC	Mini Project-III or Internship-III*	0	0	2			50			50	1
8	AHT-017	MC	Disaster Management	3	0	0	30	20	50	100		150	3
9	AHT-018	NC	Innovations and Problem Solving (Audit Course)	2	1	0	15	10	25	50		-	-
10	GP-07	NC	General Proficiency						50			-	-
			Total	**17**	**1**	**8**						**950**	**19**
11		**Minor Course (Optional)**		3	1	0	30	20	50	50		150	4
*The Internship-III (4-6 weeks) conducted during summer break after VI semester and will be assessed during VII semester													

	Departmental Elective - 4		**Departmental Elective - 5**
CET-022	Construction Planning Management	CET-025	Railway and Airport Engineering
CET-023	Pavement Design	CET-026	Water Resource Engineering
CET-024	Bridge Engineering	CET-027	Advance Environmental Engineering

HSMC-1	AHT-015	Rural Development, Administration and Planning
HSMC-2	AHT-016	Project Management & Entrepreneurship

Abbreviations: L-No. of Lecture hours per week, T-No. of Tutorial hours per week, P-No. of Practical hours per week, CT- Class Test Marks, TA-Marks of teacher's assessment including student's class performance and attendance, PS-Practical Sessional Marks, ESE-End Semester Examination, TE-Theory Examination Marks, PE- Practical External Examination Marks

1 Hr Lecture	1 Hr Tutorial	2 or 3 Hr Practical
1 Credit	1 Credit	1 Credit

EFFECTIVE FROM 2025-26

B.Tech. (CIVIL ENGINEERING) (w.e.f. 2025-26)												
SEMESTER-VIII												
Sl. No.	Subject Codes	Category	Subject	Periods			Evaluation Scheme					Subject Total	Credit
							Sessional Exam			ESE			
				L	T	P	CT	TA	Total	TE	PE		
1	AHT-016/ AHT-015	HSC	HSMC -2 / HSMC-1	3	0	0	30	20	50	100		150	3
2	CET-028-030	DE	Departmental Elective-6	3	0	0	30	20	50	100		150	3
3		OE	Open Elective-3 (Course offered from other Branch)	3	0	0	30	20	50	100		150	3
4		OE	Open Elective-4 (Course offered from other Branch)	3	0	0	30	20	50	100		150	3
5	CEP-020	DLC	Project	0	0	12			100		200	300	6
6	GP-08	NC	General Proficiency						50			-	-
			Total	**12**	**0**	**12**						**900**	**18**
7	**Minor Course (Optional)**			3	1	0	30	20	50	50	100	150	4

Subject code	Departmental Elective - 6
CET-028	Seismology and Earthquake Resistance Design of Building
CET-029	GIS and Remote Sensing and its application
CET-030	Estimating and Costing

Abbreviations: L-No. of Lecture hours per week, T-No. of Tutorial hours per week, P-No. of Practical hours per week, CT- Class Test Marks, TA-Marks of teacher's assessment including student's class performance and attendance, PS-Practical Sessional Marks, ESE-End Semester Examination, TE-Theory Examination Marks, PE- Practical External Examination Marks

1 Hr Lecture 1 Credit | 1 Hr Tutorial 1 Credit | 2 or 3 Hr Practical 1 Credit

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

HSMC-1
Rural Development: Administration and Planning (AHT-015)

L:T:P:: 3:1:0 **Credits-3**

Course Objectives

This course enables the students to:

1. Gain knowledge on the concepts related to administration, its importance and various approaches of Development Administration.
2. Gain skills on New Public Management, Public Grievances and Redressal Mechanisms, Accountability and Transparency in Administration and e-governance in the rural development sector.
3. Develop their competency on the role of Bureaucracy in Rural Development.

Course Outcomes

After completion of the course student will be able to:

1. Students can understand the definitions, concepts and components of Rural Development.
2. Students will know the importance, structure, significance, resources of Indian rural economy.
4. Students will have a clear idea about the area development programmes and its impact.
5. Students will be able to acquire knowledge about rural entrepreneurship.
6. Students will be able to understand about the using of different methods for human resource planning.

Course Contents

UNIT-I: **(8 hours)**

Rural Planning & Development: Concepts of Rural Development, Basic elements of rural Development, and Importance of Rural Development for creation of Sustainable Livelihoods, An overview of Policies and Programmes for Rural Development- Programmes in the agricultural sector, Programmes in the Social Security, Programmes in area of Social Sector.

UNIT-II: **(8 hours)**

Rural Development Programmes: Sriniketan experiment, Gurgaon experiment, Marthandam experiment, Baroda experiment, Firkha development scheme, Etawapilot project, Nilokheri experiment, approaches to rural community development: Tagore, Gandhi etc.

UNIT-III: **(8 hours)**

Panchayati Raj & Rural Administration: Administrative Structure: bureaucracy, structure of administration; Panchayati Raj Institutions Emergence and Growth of Panchayati Raj Institutions in India; People and Panchayati Raj; Financial Organizations in Panchayati Raj Institutions, Structure of rural finance, Government & Non-Government Organizations / Community Based Organizations, Concept of Self help group.

UNIT-IV: **(8 hours)**

Human Resource Development in Rural Sector: Need for Human Resource Development, Elements of Human Resource Development in Rural Sector Dimensions of HRD for rural development-Health, Education, Energy, Skill Development, Training, Nutritional Status access to basic amenities – Population composition.

UNIT-V: **(8 hours)**

Rural Industrialization and Entrepreneurship: Concept of Rural Industrialization, Gandhian approach to Rural Industrialization, Appropriate Technology for Rural Industries, Entrepreneurship and Rural Industrialization-Problems and diagnosis of Rural Entrepreneurship in India, with special reference to Women Entrepreneurship; Development of Small Entrepreneurs in India, need for and scope of entrepreneurship in Rural area.

Text Books/References:

1. Corporate Social Responsibility: An Ethical Approach - Mark S. Schwartz.
2. Katar Singh: Rural Development in India – Theory History and Policy.
3. Todaro M.P. Economic Development in III World war.
4. Arora R.C – Integrated Rural Development in India.
5. Dhandekar V.M and Rath N poverty in India.
6. A.N.Agarwal and Kundana Lal: Rural Economy of India.
7. B.K.Prasad: Rural Development-Sarup& Son's Publications.

HSMC-2

PROJECT MANAGEMENT & ENTREPRENEURSHIP (AHT-016)

L:T:P:: 3:1:0 **Credits-3**

Course Objectives:

The course should enable the students to:

1 Understand the concepts of Project Management for planning to execution of projects.
2 Understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation.
3 Be capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.
4 Understand the concepts of Entrepreneurship, role of entrepreneur in economic development, steps for establishing an enterprise.

Course Outcomes:

After completion of the course student will be able to:

1 Understand project characteristics and various stages of a project.
2 Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic.
3 Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
4. Describe Entrepreneurship, Examine role of entrepreneur in economic development.
5. Describe the steps to establish an enterprise.

Course Contents

UNIT-I: **(8 hours)**

Entrepreneurship: Entrepreneurship: need, scope , Entrepreneurial competencies & traits, Factors affecting entrepreneurial development, Entrepreneurial motivation (Mc Clellend's Achievement motivation theory), conceptual model of entrepreneurship , entrepreneur vs. intrapreneur; Classification of entrepreneurs; Entrepreneurial Development Programmes.

UNIT-II: **(8 hours)**

Entrepreneurial Idea and Innovation: Introduction to Innovation, Entrepreneurial Idea Generation and Identifying Business Opportunities, Management skills for Entrepreneurs and managing for Value Creation,

Creating and Sustaining Enterprising Model & Organizational Effectiveness.

UNIT-III: **(8 hours)**

Project Management: Project management: meaning, scope & importance, role of project manager; project life-cycle Project appraisal: Preparation of a real time project feasibility report containing Technical appraisal, Environmental appraisal, Market appraisal (including market survey for forecasting future demand and sales) and Managerial appraisal.

UNIT-IV: **(8 hours)**

Project Financing: Project cost estimation & working capital requirements, sources of funds, capital budgeting, Risk & uncertainty in project evaluation , preparation of projected financial statements viz. Projected balance sheet, projected income statement, projected funds & cash flow statements, Preparation of detailed project report, Project finance.

UNIT-V: **(8 hours)**

Social Entrepreneurship: Social Sector Perspectives and Social Entrepreneurship, Social Entrepreneurship Opportunities and Successful Models, Social Innovations and Sustainability, Marketing Management for Social Ventures, Risk Management in Social Enterprises, Legal Framework for Social Ventures.

Case study and presentations: Case study of successful and failed entrepreneurs. Power point presentation on current business opportunities..

Text Book:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harperand Row.
2. Business, Entrepreneurship and Management: Rao, V.S.P.;Vikas
3. Entrepreneurship: Roy Rajeev.
4. TextBookofProjectManagement:Gopalkrishnan,P.andRamamoorthy,V.E.;McMill.
5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.;PHI.
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.;MGH.

Construction Planning and Management (CET022)

L: T: P::3:0:0 **Credits-3**

CourseObjectives

1. Tolearnmodernconstructionequipment's
2. Tohaveknowledgeaboutconstructioncontractsanditsspecifications
3. Tolearnaboutplanningforconstructionusingnetworks.
4. Tolearnaboutconstructionqualitycontrol

CourseOutcomes

1. Anunderstandingofmodernconstructionpractices.
2. Agoodideaofbasicconstructiondynamics-variousstakeholders,projectobjectives,Processes,resourcesrequired and projecteconomics.
3. Abasicabilitytoplan,controlandmonitorconstructionprojectswithrespect totimeandcost.
4. Anideahowconstructionprojectsareadministeredwithrespect tocontractstructuresandissues.

Syllabus:

UNIT-I **(8 hours)**

NetworkTechnique: Introductiontonetworktechniques;useofcomputeraidedCPMandPERT forplanning,schedulingandcontrolofconstructionworks;barcharts:Errorinnetworks;Typesofnodesand node numberingsystems

UNIT-II **(8 hours)**

ConstructionPlanning: Planningforconstructionandsitefacilitiesusingnetworks;preparationof constructionschedulesforjobs, materials,equipment,labourandbudgetsusingCPM.

UNIT-III **(8 hours)**

ConstructionEquipmentandMethods: Equipmentforearthworks;Concreteconstruction;Aggregateproduction;Concreteproduction,handlingandplacement;Mixers,vibrationsand Temperaturecontrol

UNIT-IV **(8 hours)**

ControlonConstruction: Constructionqualitycontrolandinspection; Significanceofvariability andestimationofrisk;Constructioncostcontrolofnetworks

UNIT-V **(8 hours)**

ConstructionContracts&Specifications: Introduction,typesofcontracts,contractdocument, Specificationsimportantconditionsofcontract,arbitration.

Text/ReferenceBooks

- Srivastava,U.K.,Construction,PlanningManagement,Galgotia
- Peurifoy,R.L.,ConstructionPlanning,EquipmentsandMethods,McGrawHill.
- Ahuja,H.N.,ConstructionPerformanceControlbyNetworks,WileyInterscience.
- ModerandPhilipese,ProjectManagement withCPMandPERT,VanNOStrand.

PAVEMENT DESIGN(CET-023)

3L:0T:0P **Credits-3**

Course Objectives: The objectives of this course are to impart knowledge and abilities the students to:

1. To understand the principles of Highway geometrics design as per IRC standards.
2. To visualize the relationship between key materials and their properties along with the behaviour of pavement component systems
3. To know about the methods and equipment's Used in the Construction of Roads and their Operational approach4.
4. To learn about the various construction procedures of Flexible and Rigid pavements
5. Provide better understanding of the characteristics of the flexible and rigid pavements

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

1. Understand the basics of highway planning and design, and workout problems in design of road geometrics
2. Visualize the relationship between key materials and their properties along with the behavior of pavement component systems
3. Learn about the various construction procedures of both Flexible and Rigid pavements and Recommend pavement preservation techniques
4. Evaluate topics like design and performance of pavement surface, thick plate theory, subgrade theory, load transfer systems and joint behavior considerations, design concepts for jointed and continuously reinforced pavements.
5. Apply the principles of construction, overlaying and maintenance of highway

Syllabus:

UNIT-I **(8 hours)**

Equivalent Single Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing

UNIT-II **(10 hours)**

Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory , Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method

UNIT-III **(8 hours)**

Rigid Pavements: Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions

UNIT-IV **(8 hours)**

Rigid pavement design: IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis. PAVEMENT JOINTS: Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

UNIT-V **(6 hours)**

Evaluation and Strengthening of Existing Pavements: Benkelman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures

Text Book:

1. Principles of pavement design by E.J.Yoder& M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

Reference Books:

1. Matrix Methods of Structural Analysis, P.N. Godbole, R.S. Sonparote and S.U. Dhote, PHI Learning Pvt. Ltd., Delhi (ISBN-978-81-203-4984-1) 2014
2. Yang, Design of functional pavements, McGraw- Hill,1972
3. IRC SP-20 Rural Roads Manual
4. IRC 37 Guidelines of the Flexible Pavement Design,
5. IRC SP 62 Guidelines for the Design and Construction of Cement Concrete Pavement for Low Volume Roads.
6. IRC: 15, Standard Specifications and Code of Practice for Construction of Concrete Roads
7. IRC: 58, Guidelines for Design of Plain Jointed Rigid Pavement for Highways

Bridge Engineering (CET024)

L: T: P::3:0:0 **Credits-3**

COURSEOBJECTIVES

- Familiarizewiththetypes,suitability,selection,designcriteriaofvarioustypesofbridges
- Toimpartknowledgeforanalysisanddesignofvarioustypesofbridges
- Tounderstandthedesignofslabculvert,Boxculvert
- TounderstandthedesignofTbeambridgeandsubstructures
- Tounderstandthebridgebearings
- Tounderstandthebasicconceptsofpiersandfooting

COURSEOUTCOMES(COs)

- Specifyvarioussub-surfaceinvestigationsrequiredforbridgeconstructionandfurtherusethemto calculatethe hydraulicdesign requirementsofdifferentbridges.
- Studentswillbeabletoanalyzeanddesignallmembersofabridge.
- DesignCulvert,R.C.CTBeamBridge.
- Understandthebehaviorofcontinuousbridges,boxgirderbridges
- DesignRailwaybridges,Plategirderbridges,differenttypesofbearings,abutments,piersan dvarioustypesoffoundationsfor Bridges

SYLLABUSDETAILS:

UNIT1: (8 hours)

BasicConcepts&HydraulicCalculation: Definitionandtypesofbridge,Siteinvestigations, selection of suitable type of bridge, hydraulic calculations, linear waterway, Economicspan,afflux, scour depth.

UNIT 2: (8 hours)

Analysis &Design of Concrete Bridge: design loads for multi-lane bridges, IRC Loadingstandards, Impact factor, analysis of deck slabs, effective width method, Design of T-Beam Bridge,Pigeard's method, Courbon' method. Prestressed concrete bridge, prestress losses, temperature andshrinkage stresses. Design ofarch bridges.

UNIT 3: (8 hours)

Culvert & Steel Bridge: Design of Pipe Culverts, Design of Box Culverts, Design oflatticegirder steelbridge,introductiontocable bridges.

UNIT 4: (8 hours)
Substructure & Foundation: Introduction to bridge sub structure, analysis & design ofpier,piles&well foundation.

UNIT5: (8 hours)
Construction & Maintenance: Various types of bearings and their design-Rocker & RollerBearing,ElastomericBearing.Joints-
expansionjoints,Contractionjoints,jointseals.Bridgemaintenancemanagement:
inventory,inspectionandrehabilitation.
CasestudiesofrecentlyconstructedmajorbridgesandCriticalstudiesoffailureofmajorbridges.

TEXT/REFERENCE BOOKS:

1. DesignofBridges,N.KrishnaRaju,OxfordandIBHPublications
2. EssentialofBridgeEngineering,VictorD.J,Oxford&I.B.H
3. DesignofBridgeStructures,T.R.Jagadeesh,M.A.Jayaram,PHILearningPrivatelimited
4. ElementsofBridgeEngineering,M.K.Pant,KatsonPublications
5. BridgeDeckAnalysis,E. J.O'Brien,andD.L.Keogh,TaylorandFrancis
6. DesignofPrestressedConcreteStructures,T.Y.LinandN.H.Burns,JohnWileyandSons
7. BridgeAnalysisSimplified,B.BakhtandL.G.Jaeger,McGrawHill
8. StructuralBearings,H.EggertandW.Kauschke,Ernst&Sohn

RAILWAYS AND AIRPORT ENGINEERING (CET-025)

3L:0T:0P **Credits-3**

Course Objectives: The objectives of this course are to impart knowledge and abilities to the students to introduce the basic engineering principles that helps in the planning, design, construction, operation and maintenance of Railways and Airports

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

1. Do the design, construction, and operation of railroads and mass transit systems that use a fixed guideway.
2. Take a task that include determining horizontal and vertical alignment design, station location and design, and construction cost estimating.
3. design and construct airports. In all respect.
4. account for the impacts and demands of aircraft in their design of airport facilities.

Syllabus:

UNIT-I **(8 hours)**

Components of Railway Engineering: Permanent way components – Railway Track Gauge – Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints

UNIT-II **(8 hours)**

Geometric Design of RailwayTrack: Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT-III **(8 hours)**

Turnouts &Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed

signals – Stop signals – Signaling systems – Mechanical signaling system – Electrical signaling system – System for Controlling Train Movement – Interlocking – Modern signaling Installations

UNIT-IV **(8 hours)**

Airport Planning & Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT-V **(8 hours)**

Runway Design: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage

Text Book:

1. Chandra, S. and Agarwal, M. M., "Railway Engineering", Oxford.
2. Arora, S. P. and Saxena, S. C., "A Text Book of Railway Engineering", Dhanpat Rai Publications.
3. Mundrey, J. S., "Railway Track Engineering", Tata Mcgraw Hill.
4. Khanna, S. K., Arora, M. G. and Jain, S. S., "Airport Planning & Design", Nem Chand and Bros.
5. Horonjeff, Robert and McKelvey, Francis X., "Planning & Design of airports', 4th Ed., McGraw Hill.
6. Saxena, S.C., "Airport Engineering – Planning and Design", CBS Publishers.

Reference Books:

1. " Principles Of Railway Engineering" by Rangawala S .
2. "Railway Engineering" by Amit Gupta and B L Gupta.
3. "Highway Railway Airport and Harbour Engineering" by Subramaniam.
4. "Railway Track Engineering" by JS Mundrey

WATER RESOURCE ENGINEERING (CET026)

(3L:0T:0P) **Credits-3**

Course Objectives:

This course is aimed at teaching students

1. To understand the basic types of irrigation, irrigation standards and crop water assessment
2. To study the different aspects of design of hydraulic structures
3. To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works
4. To understand the analysis of seepage and hydraulic jump
5. To design different types of dams

Course outcomes:

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

1. to solve problem on flood routine and design various hydraulic structures
2. assess the irrigation needs of crops
3. design weirs on pervious foundation
4. design gravity dam and earthen dam design the canal systems
5. select and design canal fall

Course Content:

Unit – 1 [10 Hours]

Water requirement of crops, factors affecting water requirement, crop season, crop period, base period, delta and duty, consumptive use of water, frequency of irrigation, irrigation efficiency.

Water logging: causes and effects of water logging, anti-water logging measures, Land drainage, Design of drainage system, Tile drains.

Unit - 2 [10 Hours]

Systems of irrigation, lift irrigation, flow irrigation, methods of distribution of water, Flow irrigation: selection of dam or barrage site, types of canals, alignment of canals, Design of canal section: Kennedy's and Lacey's theory, canal lining, Diversion head works, Canal head regulators, canal falls, outlets..

Cross drainage works (Theory only).

Unit - 3 [4 Hours]

Weirs and barrages: types of weirs and barrages and their components, Bligh's creep theory, Khosla's theory. Calculation of scour depth.

Unit - 4

[10 Hours]

Dams: classification of dams, forces acting on gravity dams, economical height of gravity dams, Gravity dams (Stability Analysis, Design and construction), earth dams, causes of failure of earth dams, methods of preventing

failure of earthen dams, design of filters.

Unit - 5 [6 Hours]

Spillways: Type of Spillways, Spillway gates, Types of hydraulic jumps, Energy dissipaters, River training works.

Text Book & Reference Books

1. Irrigation Engineering and Hydraulic Structures by S.K. Garg, Standard Publishers
2. Engineering Hydrology by K. Subramanya, Tata Mc Graw Hill
3. Irrigation Engineering by N.N. Basak, PHI.
4. Irrigation, Water Resources, and water power engineering- P. N. Modi, Standard Book House.
5. Irrigation and water power Engineering- Dr. Punmia and Dr. Pande, Standard Publisher.
6. Irrigation: Theory and Practice by Michael. Vikas Publishing House, 2009.

Advanced Environmental Engineering (CET027)

L:T:P:: 3:0:0 **Credits-3**

COURSE OBJECTIVES:

1. To impart knowledge and skills in the collection, storage, transport, treatment, disposal and recycling options for liquid and solid wastes including the related engineering principles, design criteria, methods and equipments.

COURSE OUTCOMES:

After successfully studying this course, students will:

1. Be able to understand the characteristic of wastewater, and able to treat for different uses.
2. Be able to identify the effect of the pollutants on the quality of water and soil.
3. Be able to plan strategies to control, reduce and monitor water pollution.
4. Be able to select the most appropriate technique for the treatment of wastewater.
5. Be able to design various treatment units for wastewater management.

SYLLABUS:

Unit- I **(8 hours)**

Study on wastewater generation points, wastewater characteristics and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers shapes design parameters, operation and maintenance of sewers. Sewer appurtenances, hydraulic of sewers, design of sewer, laying of sewers, sewerage systems.

Unit- II **(8 hours)**

Design of various primary units in a Sewage Treatment Plant, Coarse screens, Fine screens, Oil & Grease Trap, Grit Chamber, Primary Sedimentation Tank.

Unit- III **(8 hours)**

Design of secondary treatment units, Activated sludge process, Trickling filter, Oxidation ditch, oxidation pond. Sequential batch reactor, rotating biological contractor, upflow anaerobic sludge blanket (UASB) reactor.

Unit- IV **(8 hours)**

Wastewater and sludge reuse system, wastewater disposal on land, water bodies and treatment and disposal of sludge, septic tank.

Unit- V **(8 hours)**

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle energy recovery, treatment and disposal). Solid waste from construction activities. Types and nature of hazardous waste.

TEXT BOOKS:

1. Sewage Waste Disposal and Air Pollution Engineering By Santosh Kumar Garg (Environmental Engineering (Vol.II).
2. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
3. Introduction to Environmental Engineering by P. AarneVesilind, Susan M.Morgan, Thompson /Brooks/Cole; Second Edition 2008.
4. Peavy, H., Rowe, D.R, Tchobanoglous, G. Environmental Engineering, McGraw - Hill International Editions, New York 1985.

REFERENCE BOOKS:

1. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.

Design Software Lab.(CEP017)

L: T: P::0:0:2 **Credits-1**

COURSE OBJECTIVES

7. To teach the students to understand the details of STAAD.Pro software package.
8. To enable the students to prepare input data for RCC & Steel structures.
9. To enable the students to design different components of structures.

COURSE OUTCOMES

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

10. Understand the details of STAAD.Pro software package.
11. To prepare input data of STAAD.Pro.
12. Run STAAD.Pro for analysis and desing of structures.
13. Design different components of structures.

LIST OF PRACTICALS:

14. Design of simply supported RCC beam.
15. Design of cantilever RCC beam.
16. Design of continuous RCC beam.
17. Design of simply supported Steel beam.
18. Design of continuous Steel beam.
19. Design of RCC columns with different end conditions.
20. Design of Steel columns with different end conditions.
21. Design of steel trusses.
22. Design of RCC portal frames.
23. Design of steel portal frames.

Reference book

Staad pro manual
Staad pro book
Steel Design book
Reinforced design book

DISASTER MANAGEMENT (AHT-017)

L:T:P:: 3:0:0 **Credits-3**

COURSE OBJECTIVES:

The course should enable the students to:

1. To introduce the students to various types of natural and manmade disasters.
2. To understand causes and impact of disasters.
3. To understand approaches of Disaster Management .
4. To build skills to respond to disaster.

COURSE OUTCOMES:

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

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
3. To understand approaches of Disaster Management.
4. To build skills to respond to disaster.

Unit-1Introduction to Disasters

Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks). Disaster Types, Trends, Causes, Consequences and Control of Disasters, Geological Disasters; Hydro-Meteorological, Biological, Technological and Manmade Disasters.

Unit-2 Disasters: Classification, Causes, Impacts

(Including social, economic, political, environmental, health, psychosocial, etc.)

Differential impacts-in terms of caste, class, gender, age, location, disability. Global trends in disasters urban disasters, pandemics, complex emergencies, Climate change.

Unit-3 Approaches to Disaster Risk Reduction:

Disaster cycle- its analysis, Phases, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural- nonstructural measures, roles and responsibilities of community, Panchayati Raj Institutions/ Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders.

Unit-4 Inter-relationship between Disasters & Development

Factors affecting Vulnerabilities, differential impacts, Impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources

Unit-5 Disaster Risk Management in India:

Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Text/Reference Books:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
5. Modh S. (2010) Managing N

CONSTRUCTION PROJECT PLANNING AND MANAGEMENT(CET-044)
3L:1T:0P **Credits-4**

Course Objectives: To impart knowledge about basics of construction, planning and management of any project.

Course Outcomes:

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

1. To execute all type of managerial tasks in construction projects.
2. To plan, schedule and control the construction of the project.
3. To use project planning tools.
4. To carry out cost analysis and project updating.
5. To study risk analysis and resource allocation at site.

Syllabus:

UNIT-I **(8 hours)**

Introduction: A construction project, Phases of construction project, Importance of construction and constructionindustry, Stakeholders of construction Management**,** Construction company structure of construction organization, Organizing for construction project management, Management levels, Traits of project manager and coordinators. Ethical conduct for engineers, Factors for success of a construction organization

UNIT-II **(8 hours)**

Construction planning and scheduling: Types of project **plans**, Work breaks down structure, Planning techniques, Bar charts, CPM and PERT network analysis**,** Precedence network ladder network, Line of balance method. Project scheduling and Resource levelling, Resource allocation, Importance of project scheduling, derivingother schedules, Network crushing and cost time trade off.

UNIT-III **(8 hours)**

Construction equipment and Account management: Construction equipment advanced concepts **in** economic analysis. Construction accounts management Principles of accounting, accounting process construction contractrevenue recognition, Construction contract status report, Limitation of accounting, Balance sheet, Profit and loss account, Working capital, Ratio analysis, Fund flow statement

UNIT-IV **(8 hours) Management**

material and cost: Material management functions, Inventory, Project cost management, Collection of cost related information, Cost codes**,** Cost statement, Value management in construction, Steps, Value engineering application in a typical case project, management, Job layout.

UNIT-V **(8 hours)**

Construction quality and safety management: Construction quality, Inspection, Quality control and Quality assurar in projects, Total quality management, Quality gurus and their teaching cost of quality ISO standards, Principles of quality management systems, (CONQUAS) construction quality assessment system, Construction safety management Evolution of safety, Accident causation theory, Unsafe conditions, Unsafe acts health and safety act and regulation cc of accidents, Role of safety personnel, Accident causes and principles of safety, Safety and health management syster

Text Book:

1. Construction project management: Theory and Practices, 2nd edition, 2016, Kumar Niraj Jha, Pearson EducationPublishers.
2. Project management for engineering and Construction, By GaroldD Oberlender, 2nd Edition, McGraw Hill Education (**India)**, Pvt. Ltd.

Reference books:

1. A management guide to PERT/ CPM by Weistand Levy, Prentice H**all**
2. Construction planning and management, P S Gehlot and B M Dhir, Wiley Eastern Ltd.

Infrastructure Planning and Management (CET045)

L: T: P::3:1:0 **Credits-4**

COURSEOBJECTIVES:

1. Tostudythenecessityofinfrastructureanditsmanagement.
2. Tostudytheinfrastructuralplanning.
3. Tostudythetheoreticalconceptswhichareappliedtorealproblemsencounteredintheplanning,managementand operation ofinfrastructure.
4. TostudythefinancemanagementFundamentals&Evaluationandmanagerialeconomics.

COURSEOUTCOMES**:**

1. Understandinfrastructureorganizations.
2. AchieveKnowledgeofPlanninganddevelopmentofproblemsolvingskillsinmanagement.
3. Understandtheprinciplesoffinancialfundamentals.
4. Preparetenderdocumentsforinfrastructureprojectcontract.

SYLLABUS:

UNIT-I **(8 hours)**

Infrastructure:
Definitionsofinfrastructure,GoverningFeatures,HistoricaloverviewofInfrastructuredevelopmentinIndia, InfrastructureOrganizations&Systems.

UNIT-II **(12 hours)**

InfrastructurePlanning:
Typicalinfrastructureplanningsteps,Planningandappraisalofmajorinfrastructureprojects,Screeningofprojectideas,Lifecycleanalysis,Multi-criteriaanalysisforcomparisonofinfrastructurealternatives,Procurementstrategies,Schedulingandmanagementofplanningactivities,InfrastructureProjectBudgetingandFunding, RegulatoryFramework,Sourcesof Funding.

UNIT-III **(12 hours)**

ProjectManagementinConstruction: Introductiontoprojectmanagementprocesses-Initiating,Planning,Executing,Controlling,andClosingprocesses;ProjectIntegrationManagement-Projectplandevelopment,Projectplanexecution,andOverallchangecontrol;ProjectScope Management - Initiation, Scope planning, Scope definition, Scope verification, and Scopechangecontrol.

UNIT-IV **(8 hours)**

ContractsandManagementofContracts:
Engineeringcontractsanditsformulation,Definitionandessentialsofacontract,Indian ContractAct1872,typesofcontractsandclausesforcontracts,Preparationoftenderdocuments,Issues related to tenderingprocess, Awardingcontract.

Referencesbooks:–

1. A.S.GoodmanandM.Hastak,Infrastructureplanninghandbook:Planning,engineering,andeconomics,McGraw-Hill,NewYork, 2006.
2. J.ParkinandD.Sharma,Infrastructureplanning,ThomasTelford,London,1999.
3. P.Chandra,Projects:Planning,analysis,selection,financing,implementation,andreview,TataMcGraw-Hill, NewDelhi, 2009.
4. J.D.Finnerty,Projectfinancing-Asset-basedfinancialengineering,JohnWiley&Sons,NewYork, 1996.
5. L.SquireandH.G.vanderTak,Economicanalysisofprojects,JohnHopkinsUniversityPress,London,1975.
6. T.Hegazy,Computer-basedconstructionprojectmanagement,PrenticeHall,NewJersey,2002.
7. S.M.Levy,Projectmanagementinconstruction,5thed.,McGrawHill,NewYork,2007.

BASICS OF GROUND WATER ENGINNEING (CET046)

(3L:0T:0P) **Credits-3**

Course Objective

This course is aimed at teaching students

1. To provide essential knowledge of groundwater flows.
2. This will enable the students to estimate parameters and develop and use the models for groundwater management.

Course Outcome

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

1. Understand basic concepts related to origin and flow of ground water.
2. Perform pump test analysis and compute discharge of wells.
3. Understand the causes and mechanisms of contamination of ground water.
4. Apply the analytical and numerical models for assessing flow and transport of contaminants in ground water.

Course Content

Unit I: [06 Hours]

Introduction: Definition of groundwater, role of groundwater in hydrological cycle, groundwater bearing formations, classification of aquifers, flow and storage characteristics of aquifers, Darcy's law, anisotropy and heterogeneity.

Unit II: [12 Hours]

Governing Equations for Groundwater Flow: Dupuit-Forchheimer assumptions, general differential equations governing groundwater flows, analytical solutions.

Wells and Well Hydraulics: Different types of wells, construction of wells, steady and unsteady state solutions for confined, unconfined and leaky aquifers, effect of boundaries, method of images, pumping test analysis.

Unit III: [10Hours]

Groundwater Conservation: Regional groundwater budget; resource assessment; estimation of recharge, Indian practice, artificial recharge,
Groundwater Quality: General problem of contamination of groundwater, sources, remedial and preventive measures, seawater intrusion in coastal aquifers.

Unit IV: [8 Hours]

Groundwater Flow Modelling: Role of groundwater flow models, reference to hydraulic, Hele-Shaw and analog models, introduction to numerical modeling,

Unit V: [4 Hours]

Planning of Groundwater Development: constraints on the development, role of flow models, optimal groundwater development.

Text Book & Reference Books

1. Todd,D.K.,"Groundwater Hydrology", JohnWiley, 1959
2. Bear, J.,"Hydraulics of Groundwater",McG raw Hill, 1979
3. Bouwer,H.,"Groundwater Hydrology",McGrawHill, 1978
4. Walton,W.C.,"Groundwater Resources Evaluation",McGrawHill,1970
5. Freeze and Cherry,"Groundwater",Prentice Hall.1979
6. Driscoll,F.G.,"GroundWater and Wells",Johnson Division,1986.
7. Raghunath,H.M.,"GroundWater",NewAge International (P) Limited, 2007

TheoryandApplicationsofGIS (CET- 047)

3L:0T:0P **Credits-04**

Course Objectives: Thecourseobjectiveistoprovidebasicknowledgeof GIStheoryandengineering applications using the existing state-of-the-art GIS software.

Course Outcomes:

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

1. Understand the concepts of GIS
2. Use various types of Data required in GIS
3. Apply GIS to Field Mapping

Syllabus:

UNIT-I **(8 hours)**

Introduction,GeographicalconceptsandTerminology,DifferencebetweenImageProcessing system and GIS, Utility of GIS. VariousGISpackagesandtheirsalientfeatures,EssentialscomponentsofGIS,Data acquisition through scanners and digitizers

UNIT-II **(8 hours)**

Raster and Vector Data: Introduction, Descriptions: Raster and Vector data, Raster Versus Vector, Raster to Vector convers Remote Sensing Data in GIS, Topologyand Spatial Relationships, Data storage verification and editing

UNIT-III **(8 hours)**

Datapreprocessing,Georeferencing,Datacompressionandreductiontechniques, Runlengthencoding,Interpolationofdata,DatabaseConstruction,GISandtheGPS, DataOutput

UNIT-IV **(8 hours)**

Databasestructure,Hierarchicaldata,Networksystems,Relationaldatabase,Database management,Datamanipulationandanalysis, SpatialandmathematicaloperationsinGIS,Overlay,Querybased,Measurementand statisticalmodelling,Buffers,SpatialAnalysis,StatisticalReportingandGraphing

UNIT-V **(8 hours)**

ProgramminglanguagesinGIS,VirtualGIS,WebGIS, ApplicationofGIStovariousnaturalresourcesmappingandmonitoringand engineeringproblems

Text Book:

1. Ghosh,S.K.andChandra,A.M.,"RemoteSensingandGIS",NarosaPublishing House
2. Burrough,P.A.andMcDonnel,R.A.,"PrinciplesofGeographicInformation System",OxfordUniversityPress

Reference books:

3. Chrisman,NicholasR.,"ExploringGeographicInformationSystems",JohnWiley.
4. Demers,MichaelN.,"FundamentalsofGeographicInformationSystem",2nd Ed.Wiley.

Innovations and Problem Solving(AHT-018)

L:T:P: 2:1:0 **Credits-0**

PREREQUISITE:

Basic Engineering Aptitude

COURSE OBJECTIVES:

This subject aims to inculcate critical thinking abilities and application of knowledge for problem solving. It will expose the students with various simple methods and practices that are essential to development of new systems, problem formulation and problem solving in technical and non-technical fields. This course will stimulate the work environment of the modern day engineers and technologists by familiarizing them with the state-of-the art results, design and analysis tools in various disciplines, the ability to extract relevant information to formulate and solve problems arising in practice.

COURSE OUTCOMES:

The course will enable students to,

1. Identify the market and value proposition
2. Carry out rigorous and accessible formulation to problems
3. Solutions via reducing the search space
4. Eliminating tradeoffs to reduce dimension of optimization problems
5. Execution through developing strategies for experiment, construction and monetization.
6. Simulate the work environment of the modern engineer or knowledge worker in general.

Unit – I **8 Hrs**

Introduction to Critical Design Thinking

- Understanding critical thinking, creative thinking, and problem solving through examples.
- New ways to solve problems.

Unit – II **8 Hrs**

Theory of Inventive Problem Solving

- Examples of inventive problem solving,
- Era of technical systems,
- Science of inventing,

- Art of inventing,
- Amazing world of tasks

Unit – III **8 Hrs**

Logic and Tools for Creativity and Clarity of Thought

- TRIZ tools for creativity and solutions,
- World's known solutions,
- Fundamentals of Problem solving,
- Thinking in Time and Scale,
- Uncovering and solving contradictions,
- Fast Thinking with ideal outcome.

Unit – IV **8 Hrs**

Modeling for Problem Solving

- Moving from problem to ideal final result,
- Tradeoffs and inherent contradictions,
- Invisible reserves,
- Law of increasing ideality,
- Evaluation of solutions,
- Enriching models for problem solving.

Unit – V **8 Hrs**

Principles for Innovation

- General review,
- Segmentation, Separation,
- Local quality, symmetry change, merging and multifunctionality,
- Nested doll and weight compensation,
- Preliminary counteraction, preliminary action, and beforehand compensation,
- Equipotentiality, the other way around and curvature increase,
- Dynamic parts, partial or excessive actions, dimensionality change, mechanical vibration
- Periodic action, continuity of useful action, and hurrying,
- Blessing in disguise, feedback, and intermediary,
- Self service, copying, cheap disposables, and mechanical interaction substitution
- Pneumatics and hydraulics, flexible shells and thin films, and porous materials,
- Optical property changes, homogeneous, and discarding and recovering,
- Parameter changes, phase transitions, and thermal expansion,
- Strong oxidants, inert atmosphere, and composite materials,
- How to select most suitable principle out of 40 ways to create good solutions

References

1. ABC-TRIZ Introduction to Creative Design Thinking with Modern TRIZ Modeling by Michael A. Orloff
2. TRIZ And Suddenly the Inventor Appeared TRIZ, the Theory of Inventive Problem Solving by GenrichAltshuller
3. TRIZ for Engineers Enabling Inventive Problem Solving by Karen Gadd

4. Simplified TRIZ New Problem Solving Applications for Engineers and Manufacturing Professionals by Rantanen K., Domb E.

Seismology and Earthquake Resistant Design of Buildings (CET028)

L: T: P:: 3:0:0 **Credits-3**

Course Objective:

To provide a coherent development to the students for the courses in sector of earthquake engineering. To present the foundations of many basic engineering concepts related earthquake Engineering. To give an experience in the implementation of engineering concepts which are applied in field of earthquake engineering. To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

Course Outcomes:

1: Discuss the equations of motion for un-damped free vibrations for SDOF and 2DOF systems.
2: Explain the engineering seismology including causes and effects of earthquakes.
3: Analyse a multi-storeyed structure using Equivalent Static Method and Response Spectrum methods.
4: Assess various irregularities in buildings.
5: Apply the provisions of IS:1893, 13920 and IS: 4326 to building structures.

Syllabus:

UNIT I: **(8 Hours)**

Engineering Seismology: Elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves. Seismic intensity, Seismic Magnitude, Richter scale, Seismic zoning maps of India, Response spectra, Strong ground motion characteristics.

UNIT II: **(8 Hours)**

Earthquake effects on the buildings: Behavior of various types of buildings in past earthquakes, classification of loads, Design philosophy, Seismic methods of analysis, Seismic damages during past earthquakes and effect of irregularities and building architecture on the performance of RC structures.

UNIT III: **(8 Hours)**

Seismic analysis of RC buildings: Mathematical modeling of multistoried RC buildings with modeling of floor diaphragms and soil-foundation. Seismic analysis by Equivalent static lateral load method and Response Spectrum Method as par IS 1893. Infill wall, failure mechanism of in-filled frame, analysis of in-filled frame.

UNIT IV: **(8 Hours)**

Ductile designing of RC buildings: Ductility of reinforced concrete members subjected to flexure, axial load and shear. Detailing of reinforced concrete members, Ductility requirements, types of ductility, factors affecting ductility. Ductile detailing as per latest IS: 13920, design of Shear Walls.

UNIT V: **(8 Hours)**

Repair and Retrofitting Techniques: Principle of Repair and Retrofitting, Criteria for Repair, Restoration and Retrofitting, Classification of retrofitting techniques, Conventional and non-conventional methods, Comparative study of various methods and case studies. Techniques of repair and retrofitting of RC buildings, Retrofitting of buildings by Base Isolation. Retrofitting of masonry structures, failure modes of masonry structures and repairing techniques.

Text Books:

1. Dynamics of Structures, R.W. Clough and J. Penzien, McGraw Hill, 1993, 2nd Edition.
2. Dynamics of Structures - Theory and application to earthquake engineering, A. K. Chopra, Pearson Education, 2007, 3rd Edition.
3. Earthquake Resistant Design of StructuresP. Agarwal and M. Shrikhande, Prentice Hall Publications, 2006, 1st Edition.
4. Earthquake Resistant Design for Engineers and Architects, D. J. Dowrick, John Wiley and Sons, 2009, 2nd Edition.
5. IS:1893;13935;4326;13828;13827;13920 Code of Practice, BIS Codes, New Delhi.

GIS AND REMOTE SENSING AND ITS APPLICATION (CET-029)

3L:0T:0P **Credits-3**

Course Objectives: To impart knowledge on advanced surveying, photogrammetry, remote sensing, and Geographic Information Systems (GIS).

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

1. basic knowledge of GIS theory and engineering applications using the existing state-of-the-art GIS software
2. Advanced knowledge of surveying
3. Basic knowledge of Digital Image Processing

Syllabus:

UNIT-I **(12 hours)**

GIS: Introduction of geographic information system (GIS), Vector and raster data, database creation, digital elevation model (DEM), Analysis in GIS. Geographical concepts and Terminology, Difference between Image Processing system and GIS, Utility of GIS, Various GIS packages and their salient features, Essentials components of GIS, Data acquisition through scanners and digitizers. Spatial and mathematical operations in GIS, Overlay, Query based, Measurement and statistical modelling, Buffers, Spatial Analysis, Statistical Reporting and Graphing

UNIT-II **(8 hours)**

Remote Sensing: Basic remote sensing, interaction mechanism with atmospheric and earth surface, platforms and sensors.

Digital Image Processing: Digital image, introduction to digital image processing, preprocessing, enhancement, classification, accuracy assessment

UNIT-III **(8 hours)**

Data Products: Various remote sensing data products, high resolution and Hyperspectral images, visual data interpretation for information extraction. Remote Sensing Data in GIS, Topology and Spatial Relationships, Data storage verification and editing

UNIT-IV **(6 hours)**

Application of GIS to various natural resources mapping and monitoring and engineering problems

UNIT-V **(6 hours)**

Applications ofRemote Sensing: Applications in various civil engineering projects

Text Book:

1 Burrough, P.A. and Mc Donnel, R.A., "Principles of Geographic Information System", Oxford University Press. 2000
2 Chrisman, Nicholas R., "Exploring Geographic Information Systems", John Wiley. 2002
3 Demers, Michael N., "Fundamentals of Geographic Information System", 2 nd Ed. Wiley. 2008
4 Ghosh, S.K. and Chandra, A.M., "Remote Sensing and GIS", Narosa Publishing House. 2008
5 Lo, C.P. and Young, A.K.W., "Concepts and Techniques of Geographical Information System", Prentice Hall India. 2002
6 Longley, Paul A, Goodchild, Michael F., Maguire, David J. and Rhind, David W., "Geographic Information Systems and Science", Wiley 2001

Reference Books:

1. Lillesand, T.L., and Kiefer, R.W., "Remote Sensing and Image Interpretation, 4th Edition, John Wiley & Sons
2. Agarwal, C.S. and Garg, P.K., "Remote Sensing in Natural Resources Monitoring and Management", Wheeler Publishing House.2000

ESTIMATION AND COSTING (CET-030)

3L:0T:0P **Credits-3**

Course Objectives:

1. Determination of quantities of items and labour requirement of civil engineering works.
1. Preparation of estimate of the civil engineering works.
2. Preparation of specification of construction items.
3. To introduce the students in depth knowledge of professional practice as well the quantity analysis of construction works like, multi-storied structures, Water works & sanitary works, Irrigation works, Road estimates, culverts, etc.

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

1. Do of estimating, costing and professional practice, which will be use full in tackling real life problems.
5. Understand the procedure to carry out the estimation and steps to prepare reports of construction works.
6. Learn the purpose and importance of valuation

Syllabus:

UNIT-I **(8 hours)**

Introduction & Estimation of Buildings: Importance of estimation in Civil Engineering, Different types of Estimates, methods in Estimation, Study of various drawings with estimates, Concept of measurement, units of measurement. Methods of taking out quantities and cost by Centre line method and long wall and short wall method. Preparing of detailed estimates and abstract for the building, flat and sloped roof. Estimate of repair works and demolition of Civil Engineering structures.

UNIT-II **(8 hours)**

Estimation of R.C.C. Structures: Estimates of components RCC works in beams, column footings and roof slabs, Estimation of septic tank, manhole and RCC slab culverts. Estimation of industrial building with steel truss,

Estimation of framed structures.

UNIT-III **(8 hours)**

Specifications and Rate Analysis: Definition of specifications, objectives of writing specification, essentials of specification of various items of working in buildings. Importance working out quantities and rates for the following standard items of works-earth works in different types of soils, cement concrete of different mixes, Brick masonry, Stone masonry, Plastering, Painting and steel works, wooden works for doors, windows and ventilator.

UNIT-IV **(8 hours)**

Estimation of Earth Work and Road Projects: Methods for computation of Earthwork-cross sections-mid sections formula, trapezoidal and average end area or mean sectional formula, proportional formula for different terrains. Estimation of Road Works - WBM, Bituminous mixes and cement concrete roads

UNIT-V **(8 hours)**

Valuation: Purpose of valuation, types of property- Depreciation, Sinking fund, Lease hold and free hold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and year's purchase. Rental method of valuations, and typical problems

Text Book:

1. B. N. Dutta, Estimating and Costing In Civil Engineering, Ubs Publishers Distributors Ltd.
2. S. C. Rangwala, Estimating and Costing, Charotar Publishing House, Anand
3. G. S. Biridi, Textbook of Estimating & Costing, DhanapatRai& Sons. Delhi.
4. M.Chakroborti, Estimating, Costing, Specification and Valuation.Calcutta

Reference Books:

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1. P.W.D. Hand Book and IS Codes
2. Rangwala, S.C., Elements of Estimating and Costing, Professional practice, Charotar Publishing House,

DISASTER PREPAREDNESS AND PLANNING(CET048)

3L:1T:0P **Credits-4**

Course Objectives: to gain knowledge in the field of disaster management and minimize its effects.

Course Outcomes:

The student will develop competencies in

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

Syllabus:

UNIT-I **(6 hours)**

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

UNIT-II **(8 hours)**

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

UNIT-III **(6 hours)**

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 nationaldisaster trends; climate change and urban disasters

UNIT-IV **(12 hours)**

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

programmesin India and the activities of National Disaster Management Authority.

UNIT-V **(8 hours)**

Disasters, Environment and Development Factors affecting vulnerability such as impact of developmental projects and environmental modifications **(**including of dams, land-use changes, urbanization etc.), sustainableand environmentalfriendly recovery; reconstruction and development methods

Text Book:

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

Reference books:

1. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

HYDRO POWER ENGINEERING (CET049)

(3L:1T:0P) **Credits-4**

Course outcome

This course is aimed at teaching students to

1. components of hydropower
2. the design of hydropower
3. They will be knowing types of turbines and when to use.
4. Importance of surge tank in the in the development of Hydropower.

Outcome of the Course

On completion of this course, the students will have :

The knowledge of the turbines and details of hydropower and its development.

UNIT I [8 Hours] **Water Power**: Introduction, sources of energy, role of hydropower in a power system. Estimation of Water Power Potential: Flow duration curves of gauge and ungauge streams, load curve, load factor, capacity factor, utilization factor, diversity factor, load duration curve, firm power, secondary power, prediction of load

UNIT II [07 Hours] **Types of Hydro-power Plants**: Run of river plants, general arrangement of run of river plants, valley dam plants, diversion canal plants, high head diversion plants, storage and pondage, pumped storage power plants

UNIT III [04 Hours]

Penstocks: General classification, design criteria, economical diameter, losses, anchor blocks, valves, bends and manifolds

UNIT IV [08 Hours]

Trash racks: Types, losses, design, stability

Intakes: Types, losses, air entrainment, anti-vortex device, air vent, power channels, forebay, tunnel

UNIT V [13 Hours]

Turbines: Introduction, types of turbines, hydraulics of turbines, velocity triangles, draft tubes, cavitation in turbines, turbine model testing, characteristics of turbines.

Water Hammer and Surges: Introduction, water hammer, transients caused by turbine, load acceptance and rejection, resonance in penstocks, surge tanks, channel surges

Text Book & Reference Books

1. Dandekar, M.M., and Sharma, K.H., "Water Power Engineering", Vikas Publishing House Pvt. Ltd. 2000
2. Barrows, H.K., "Water Power Engineering", Tata McGraw Hill Pub. Company Ltd. 1943
3. Varshney, R.S., "Hydro Power Structures", Nem Chand & Bros,2001.
4. Nigam, P.S., "Hydro Electric Engineering", Nem Chand & Bros,2001.
5. Choudhary, M.H., "Applied Hydraulic Transients", Van Nostrand Reinhold Company,1987.
6. Streeter, V.L., and Wylie, B., "Fluid Transients", McGraw-Hill Book Company,1967.
7. Warnick, C.C., "Hydropower Engineering", Prentice-Hall1984

Environmental Management and Sustainability (CET050)

L: T: P: 3:1:0 **Credits-4**

Course Objectives:

The students will be able to:

1. To create awareness towards various environmental problems.
2. To create awareness among students towards issues of sustainable development.
3. To expose students towards environment friendly practices of organizations.
4. To sensitize students to act responsibly towards environment.

Course Outcomes: The students should be able to:

1. The course will give students an overview of various environmental concerns and practical challenges in environmental management and sustainability. Emphasis is given to make students practice environment friendly behavior in day-to-day activities.

Syllabus:

UNIT-I **(8 hours)**

Introduction to Environment Pollution and Control

Pollution and its types (Air, Water, and Soil): Causes, Effects and Control measures,

Municipal Solid Waste: Definition, Composition, Effects, Electronic Waste: Definition, Composition, Effects, Plastic Pollution: Causes, Effects and Control Measures

UNIT-II **(8 hours)**

Climate Change and Environmental Challenges

Global Warming and Green House Effect, Depletion of the Ozone Layer, Acid Rain, Nuclear Hazards

UNIT-III **(8 hours)**

Environmental Management and Sustainable Development

Environmental Management and Sustainable Development: An overview, Sustainable Development Goals (17 SDGs), Significance of Sustainable Development, Environment Friendly Practices At Workplace and Home (Three Rs' of Waste Management, Water Conservation, Energy Conservation)

UNIT-IV **(8 hours)**

Environmental Acts

The Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution)

Act, 1981, The Environment (Protection) Act, 1986.

UNIT-IV **(8 hours)**

Role of Individuals, Corporate and Society

Environmental Values, Positive and Adverse Impact of Technological Developments on Society and Environment, Role of an individual/ Corporate/ Society in environmental conservation, Case Studies: The Bhopal Gas Tragedy, Narmada Valley Project,Deterioration of Taj Mahal and Uttarakhand flash floods.

TEXT BOOKS:

1. Rogers, P.P., Jalal, K.F. , Boyd, I.A.(Latest Edition) . An Introduction to Sustainable Development. Earthscan

2. Kalam, A.P.J. (Latest Edition) .Target 3 Billon: Innovative Solutions towards Sustainable Development. Penguin Books

3. Kaushik , A. and Kaushik (Latest Edition).Perspectives in Environmental Studies. New Delhi: New Age International Publishers.

4. Dhameja, S.K. (Latest Edition). Environmental Studies. S.K. Kataria and Sons.New Delhi

5. Bharucha,E. (Latest Edition). Environmental Studies for Undergraduate Courses. New Delhi: University Grants Commission.

REFERENCES:

1. R. Rajagopalan(2006).Environmental Studies. Oxford University Press.

2. M. AnjiReddy(2006).Textbook of Environmental Sciences and Technology. BS Publication.

3. Richard T. Wright(2008).Enviromental Science: towards a sustainable future PHL Learning Private Ltd. New Delhi.

4. Gilbert M. Masters and Wendell P. Ela.(2008).Environmental Engineering and science. PHI Learning Pvt Ltd.

EnvironmentalModelling& Simulation (CET-051)

3L:1T:0P **Credits-04**

Course Objectives: Todevelopstudentsskillsforusingcomputertoanalyze,designandcontrolenvironmental systems.

Course Outcomes:

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

1. Do modelingand simulation in Environmental Field
2. Gain Knowledge about Environmentalrisk and their management
3. Start using various software for design the problems related to Environment

Syllabus:

UNIT-I **(10 hours)**

Introductiontomodelingand simulation,developmentprocessandapplications; Modelclassificationandevaluation;BasicsofEnvironmentalSystemDesign; SoftwarePackages,Lumpedanddistributedparametermodels,solutionmethods usingMATLAB; Simulationmethodologies,continuous,discrete,Monte-Carlo,agent-based,game theory, system dynamics

UNIT-II **(10 hours)**

Designofexperiments, ReactorModeling, kinetics, parameterestimation,RTDstudies and flow regimes ,Clusteranalysis,ecologicalmodeling,classificationofecologicaldata,stabilityof complexecosystems

UNIT-III **(8 hours)**

Microbialdynamics,mixinginlakes,riverself-purification,dynamicsofDO,BOD andnutrients

UNIT-IV **(8 hours)**

Modeling transport phenomena atmospheric and porous media transport, transformationof pollutant

UNIT-V **(4 hours)**

Environmentalriskmanagement,healthriskassessment,Uncertainty,andinformation dissemination

Text Book:

1. Ramaswami,A.,"IntegratedEnvironmentalModeling",JohnWileyWalter
2. J. Weber,Jr.,"EnvironmentalSystemsandProcesses– Principles",Modeling andDesign,WileyInterscience

Reference books:

1. Deaton,M.LandWinebrake,J.J.,"DynamicModelingofEnvironmentalSystems", Springer-Verlag

Theory and Applications of GPS(CET-052)

3L:0T:0P **Credits-04**

Course Objectives: Thecourseobjectiveistoprovidebasicknowledgeof GPStheoryandengineering applications using the GIS

Course Outcomes:

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

1. Understand different coordinate systems used in Global positioning.
2. Understand different parameters that affect the GPS accuracy and precision.
3. Plan and perform GPS Surveys and analyse the results.
4. Covert GPS data in different formats to be used in different applications.
5. Understand the possible applications of GPS in day-to-day life as well as research fields

Syllabus:

UNIT-I **(8 hours)**

Global and local coordinates systems, Fundamentals of Geodesy, Geoid, Reference ellipsoid, relationship between satellite and conventional geodetic system, GPS positioning

UNIT-II **(8 hours)**

GPS observables (Types, errors & quantity), GPS signal structures, Pseudo ranges, carrier phases, Format of data (Rinex), propagation medium- Troposphere, ionosphere

UNIT-III **(8 hours)**

Estimation procedures, GPS data pre-processing, cycle slips, anti-spoofing, multipath Preparation of GPS surveys. Introduction to GLONASS, GALILEO and NAVIC Systems

UNIT-IV **(8 hours)**

Methods of processing of GPS data, available software, Kinematic GPS Processing, Relationship between satellite and conventional geodetic systems

UNIT-V **(8 hours)**

: Applications and examples of GPS data analysis along with other space geodetic data. Geodetic Control Surveys, GIS, Vehicle tracking and Navigation, Location based service and special applications.

Text Book:

1. Hofmann-Wellenhof, B., H. Lichtenegger, and J. Collins. GPS Theory and Practice. Springer, 1994

2. Parkinson, B. W., J. Spilker, et al. Global Positioning System: Theory and Applications. Vol. 1.

Reference books:

1. Parkinson, B. W., J. Spilker, et al Global Positioning System: Theory and Applications. Vol. 2.
2. A Text Book on GPS Surveying by Dr. Jayanta Kumar Ghosh

GeoinformaticsforNaturalDisasters (CET-053)

3L:0T:0P **Credits-04**

Course Objectives: Tointroducetheapplicationsofremotesensing,GISandGPStoolsfordisastermitigationand management.

Course Outcomes:

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

1. Gain knowledge about the nature of natural Disasters
2. Use various tools used in measuring level of disaster
3. Suggest different alternate solutions for any remedial mesures

Syllabus:

UNIT-I **(6 hours)**

Introduction to various types of disasters. Manmade and natural – earthquakes, volcanoes, landslides, floods, cyclones, tsunamis, anthropogenic, industrial, chemical andenvironmental,fireetc.Stagesofadisastermitigationplan-pre-disasterplanning, disaster preparedness, monitoring phase, emergency response or damage assessment, recovery and relief phase,

VariousGeomaticstools–TotalStation,GPS,RS,GIS,DigitalElevationmodel Generationextractionof parametersandtheiruses

UNIT-II **(10 hours)**

Earthquakes – Causative factors, hazard assessment, selection of factors, SAR Interferometry for estimation of ground displacement, creation of thematic data layers, preparationofseismichazardzonationmaps,regionalriskassessment,Geomaticstools forriskmitigationplans.Casestudies.Damage Assessment.

Landslides – Causative factors, hazard assessment, selection of factors – triggering and non-triggering, creation of thematic data layers, preparation of landslide hazardzonationmaps,regionalandsitespecificriskassessments,Modelingforriskmitigation plans. Casestudies

UNIT-III **(8 hours)**

Cyclones and Flooding: Cyclone: cyclone related parameters and effects on land andsea – damage assessment. Flooding: causes, identification of factors, space-time integration,GISdatalayers,floodproneareademarcation,analysisandmanagement, riskassessment.DamageAssessment.Casestudies,Damageassessment.

Drought and Desertification: Types of droughts, factors influencing droughts, identification of variables,development of vegetation index, assessment of land use and

groundwaterlevelchanges,delimitingdroughtproneareas,processesofdesertification, overutilizationofwaterandlandresources.GISdatalayercreation–Management strategies.Casestudies

UNIT-IV **(8 hours)**

Anthropogenic Disasters: Atmospheric Disasters : Ozone layer depletion, green house / global warming – acid rain – snow melt – sea level rise – related problems. GIS data layer creation. Case studies. Marine Disasters: oil spill and chemical pollution, coastal erosionanddeposition,factoridentification,GISanalysis,managementstrategies. Case studies.

Biodiversity Disasters: Ecological degradation – nuclear disaster and biodiversity loss. Identification of parameters (mapping of forest types, protected areas and natural forests)–populationextinction–conservingbio-diversity(speciesandsubspecies).Soil erosion,coral/mangrovedepletion,forestfire-mining.

UNIT-V **(8 hours)**

Geomaticstoolsforpreparation ofecologicaldegradationmaps,erosionmaps,deforestationmapsetc.GISin environmentalmodeling.Casestudies.

ForestFire:estimationofforestfire,extent–NBR(NormalBurntRatio),useof geomaticstoolsformonitoringandmanagement,Damageassessment

Tsunami-Introductoryconcepts,Geomaticstoolsandsystemsformonitoringand management,damageassessment. displacementstudies.

Text Book:

1. Andrew,Skeil,"EnvironmentalModelingwithGISandRemoteSensing",John Willey.
2. Ariyabandu,M.andSahniP.(Eds),"DisasterRiskReductioninSouthAsia", Prentice-Hall.

Reference books:

1. Matthews,JohnA.,"NaturalHazardsandEnvironmentalChange",BillMcGuire, IanMason.
2. Demers,MichaelN.,"FundamentalsofGeographicInformationSystems",John Willey.

GeoinformaticsforLandUseSurveys (CET-054)

3L:0T:0P **Credits-04**

Course Objectives: Toimpartadvancedknowledgeontheuseofremotesensingdatainopticalregion for preparation of land use land cover maps and their usage in urban planning

Course Outcomes:

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

1. Do Land use land cover analysis on the gathered data in field
2. Do mapping of area by using various tools
3. Classify the various images of landuse

Syllabus:

UNIT-I **(10 hours)**

Introduction. Land use& land cover— definition and its significance in engineering projects. History of land use land cover. Modern land use land cover surveys and classificationsystems.Utilityofremotesensingdataforlanduselandcovermapping at various scales, Land use land cover analysis based on spectral characteristics of remote sensing data - Visible, Near Infrared and Shortwave Infrared wavelength regions, Thermal Infrared regionsandactivemicrowaveregion,highresolutionimages,variousvegetation indices.

UNIT-II **(8 hours)**

Land use land cover analysis based on spatial characteristics of remote sensing data – utility of IFOV, land parcel sizes, minimum mapping unit, map scale, Land use land cover analysis based on temporal characteristics of remote sensing data – temporal resolution of remote sensing data, application based temporal requirements, land use land cover change detection – visual and digital change detection algorithms.Principles oflanduselandcovermapping.Visualimageinterpretationtechniquesforlanduse covermap preparation.

UNIT-III **(8 hours)**

Digital image classification for land use land cover map preparation. Per pixel classification – statistical, artificial neural network and other machine learning approaches.Objectbasedimageclassification.Conceptofmixedpixel.Subpixel classification – linear mixture modeling, fuzzy set based classification, artificial neural network and other machine learning approaches

UNIT-IV **(6 hours)**

Classificationaccuracyassessment–accuracyofperpixelandsub-pixelclassification. Samplingdesignissues,designoferrormatrixandfuzzyerrormatrix.Statisticaltesting.

UNIT-V **(8 hours)**

Issuesinurbanandregionalplanning–objectivesandplanningprocesses,data requirements.Physicalplanningandstatisticalmethods.Mappingofparcelsand individualbuildings,Utilityoflanduselandcoverinurban planning, RoleofremotesensingandGISforurbanplanning,management,andgrowth assessment.Studyo fcroppingpatternandresources.Utility/service planning. Transportationplanningandmanagement.Infrastructure planning.

Text Book:

1. Rencz,AndrewB.(Editor-in-Chief),"RemoteSensingforNaturalResourceManagementandEnvironmentalModeling",ManualofRemoteSensing,Vol.4.JohnWiley
2. Rencz,AndrewB.(Editor-in-Chief),"RemoteSensingofHumanSettlements", ManualofRemoteSensing,Vol.5,JohnWiley.

Reference books:

1. Lillesand,T.M.andR.W.Kiefer,"RemoteSensingandImageInterpretation",4th Ed.,JohnWiley.

Happiness and Well-being (AHT-014)

L:T:P: 2:0:0 **Credits-0**

Course Objectives:

1. To obtain a basic understanding of Positive emotions, strengths and virtues; the concepts and determinants of happiness and well-being.
2. To bring an experience marked by predominance of positive emotions and informing them about emerging paradigm of Positive Psychology
3. Build relevant competencies for experiencing and sharing happiness as lived experience and its implication.
4. To become aware of contextual and cultural influences on health and happiness.

Course Outcomes:

1. This course provide an insight to see the importance of positive emotions, Strength and Virtues in everyday life and society.
2. It helps to use the strength and virtues in improving human behavior and mental health.
3. This course helps to understand the biological, social, psychological and spiritual determinants of Happiness and well-being.
4. This course throws light on research findings related to effects of happiness and well-being on mental illness and stress.
5. Give an insight of the Indian philosophy of happiness and life satisfaction in context of Karma, Moksha and destiny and role of socio-demographic and cultural factors in Happiness and well-being.
6. Helps in establishing work life balance in an individual's life.

UNIT I: Introduction to Positive Psychology

Importance of positive emotions in everyday life and society, Positive Emotions and well being: Hope & Optimism, Love. The Positive Psychology of Emotional Intelligence, Influence of Positive Emotions Strength and Virtues; implications for human behavior and mental health.

UNIT II: Happiness

Determinants of Happiness and well-being – biological, social, psychological and spiritual, Types of happiness- Eudaimonic and Hedonic, Traits associated with Happiness, Setting Goals for Life and Happiness, Research findings on effects of happiness and well-being on mental illness and stress.

UNIT III: Resilience and Well Being

Meaning, Nature and Approaches Theories of Resilience, Positive Response to loss, Post Traumatic Growth, Models of PTG as Outcome, Models of PTG as a Coping Strategy Benefit Finding, Mindfulness and Positive Thinking, Building Resilience and Wellbeing.

UNIT IV: Happiness and Well-being in the Indian context

Indian philosophy of happiness and life satisfaction. – Karma, Moksha and destiny. theory of happiness and wellbeing in Taittiriya Upanishad, Role of socio-demographic and cultural factors in Happiness and well-being. Health and Happiness in contemporary India – rural and urban differences and similarities.

UNIT V:Positive work life

Employee engagement- what causes individuals to join an organization and why they stay or leave, person-centered approach to engagement Understand the concept of work as meaning, Impact of employee well-being on the organization and impact of feelings about work on the individual's well-being. Bringing Positive Psychology to Organizational Psychology

SUGGESTED READINGS:

1. Dandekar, R. N. (1963). On dharma. In De Bary (ed.) Sources of Indian Tradition. Delhi, India: Motilal Banarasidass Publishers.
2. Dandekar R. N. (1981). Exercises in Indology. Delhi, India: Ajanta Publishers.
3. Snyder, C.R., &Lopez,S.J.(2007). Positive psychology: The scientific and practical explorations of human strengths. Thousand Oaks, CA: Sage. Snyder, C. R., & Lopez, S. (Eds.). (2002). Handbook of positive psychology. New York: Oxford University Press.
4. Seligman, M. (2011). Flourish: A Visionary New Understanding of Happiness and Well-being, Atria Books.
5. Peterson, C. A. (2006). A Primer in Positive Psychology, Oxford University Press.
6. Nettle, D.S. (2006). Happiness: The Science Behind Your Smile, Oxford University Press.
7. Lyubomirsky, S. (2013). The Myths of Happiness: What Should Make You Happy, but Doesn't, What Shouldn't Make You Happy, but Does, Penguin

Annexure - II

List of Minor Courses offered by Department of Civil Engineering to B. Tech. Programme

S. N.	Award of Degree	Eligible Major B. Tech. Degree programmes (Discipline / Branch of Study as Prescribed by the University from time to time) For minor Degree	Offering Department	Minor Degree (After successfully passing the subjects worth 20 Credits as available against each Minor)*
1	"B. Tech. in branch name--- with Minor in **Basic Civil Engineering**	Artificial Intelligence & Machine Learning Computer Science (Artificial Intelligence &Machine Learning) Biotechnology Bio Chemical Engineering Chemical Engineering Computer Science and Engineering Electrical Engineering Electrical & Electronics Engineering Electronics & Communication Engineering Information Technology Mechanical Engineering Mechanical Engineering (Manufacturing Engineering) Production Engineering Manufacturing Engineering Power Plant Engineering	**CED**	**Basic Civil Engineering** 1. Introduction to Civil Engineering 2. Basics of Geomatics Engineering 3. Traffic planning andManagement. 4. Environment Impact Assessment Technique 5. Machine Foundation 6. Construction project planning and management 7. Infrastructure planning and management 8. Disaster preparedness and planning 9. Hydropower Engineering
2	"B. Tech. in branch name with Minor in **Environmental Engineering**	Artificial Intelligence & Machine Learning Computer Science (Artificial Intelligence &Machine Learning) Biotechnology Bio Chemical Engineering Chemical Engineering Computer Science and Engineering Electrical Engineering Electrical & Electronics Engineering Electronics & Communication Engineering Information Technology Mechanical Engineering Mechanical Engineering (Manufacturing Engineering) Production Engineering Manufacturing Engineering Power Plant Engineering	**CED**	1. Basics of water treatment 2. Basics of water quality management 3. Air, Noise Pollution and Control 4. Introduction to Environmental Engineering 5. Environment Impact Assessment Technique 6. Basics of ground water engineering 7. Environmental management and sustainability 8. Environmental modelling & Simulation
3	"B. Tech. in branch name with Minor in ***Geoinformatics Engineering***	Artificial Intelligence & Machine Learning Computer Science (Artificial Intelligence &Machine Learning) Biotechnology Bio Chemical Engineering Chemical Engineering Computer Science and Engineering Electrical Engineering Electrical & Electronics Engineering Electronics & Communication Engineering Information Technology Mechanical Engineering Mechanical Engineering (Manufacturing Engineering) Production Engineering Manufacturing Engineering Power Plant Engineering	**CED**	**Geoinformatics Engineering** 1. Surveying measurements and Adjustments 2. Principle of Photogrammetry 3. Basics of Remote Sensing and Image Processing 4. Basics of Analytical and Digital Photogrammetry 5. Theory and Application of GIS 6. Theory and Application of GPS 7. Geoinformatics for Natural Disasters 8. Geoinformatics for Land use Surveys

***If required the student may opt requisite fundamental course/s for a minor specialization as audit course.**

Annexure II

List of Open Elective for other Branches of Engineering

Seventh Semester
(Any one)

1. Renewable Energy Resources (CET 055)
2. Advanced foundation Engineering (CET 056)

Eight Semester
(Any Two)

1. River Engineering (CET 057)
2. Repair and Rehabilitation of Structures (CET 058)
3. Rock engineering (CET 059)
4. Construction Equipment and Automation (CET 060)

RENEWABLE ENERGY RESOURCE(CET-055)
L:0T:0P **Credits 03**

Course Objectives: The objectives of this course are to impart knowledge and abilities the students to:

1. Understanding basic characteristics of renewable sources of energy and technologies for their utilization.
2. To give review on utilization trends of renewable sources of energy.
3. To give review on legislative and regulatory rules related to utilization of renewable sources of energy.
4. Make interpretation about the energy sources.
5. To comprehend the energy & its resources

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

1. Understand the need of energy conversion and the various methods of energy storage.
2. Explain the field applications of solar energy.
3. Identify Winds energy as alternate form of energy and to know how it can be tapped.
4. Explain biomass generation and its impact on environment
5. Understand the Geothermal &Tidal energy, its mechanism of production and its applications.
6. Illustrate the energy efficient motors & equipments for better applications

Syllabus:

UNIT-I **(8 hours)**

Renewable Energy Systems: Energy Sources, Comparison of Conventional and nonconventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management

UNIT-II **(10 hours)**

Wind Energy System :Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind-diesel, and wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for standalone systems. Use of electronic load controllers and self excited induction generators. Wave Energy System: System configuration: grid connected and hybrid Systems.

UNIT-III **(8 hours)**

Solar Radiation :Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Phototonic System Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels. Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or

hybrid modes, Biomass energy and their characteristics.

UNIT-IV **(6 hours)**

Energy from oceans: Ocean temperature difference, Principles of OTEC, plant operations, Geothermal Energy Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern nonconventional energy sources.

UNIT-V **(8 hours)**

Electric Energy Conservation :Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, air conditioning, power plants, process industries, illumination etc. Methods of Energy Audit. Measurements systems; efficiency
measurements. Energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers

Text Book:

1. John Twidell& Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York USA

Reference Books:

1. Anna Mani, "Wind Energy Resource Survey in India-Ill", Allied Publishers Ltd., New Delhi,
2. S.P. Sukhatme: Solar Energy, TMH- 4e,
3. Solanki –Renewable Energy Technologies – PHI Learning
4. Sawhnew –Non Conventional Energy Resources – PHI Learning

ADVANCED FOUNDATION ENGINEERING (CET-056)

3L:0T:0P **Credits: 03**

Course Objectives: The objectives of this course are to impart knowledge and abilities the students to:

1. Design a shallow foundation subjected to eccentric & inclined loads.
2. Design of deep foundation i.e., piles based on settlement & bearing capacity criteria.
3. Impart knowledge on earth pressure theories in design of gravity and cantilever retaining wall.
4. Narrate the importance of apparent earth pressure diagrams in design of sheet piles & braced cuts.
5. Design of foundations in Expansive soils.

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

1. Determine the earth pressures on foundations and retaining structures.
2. Analyze shallow and deep foundations.
3. Calculate the bearing capacity of soils and foundation settlements.

Syllabus:

UNIT-I **(8 hours)**

Planning of Soil Exploration for different projects, methods of subsurface exploration, methods of borings along with various penetration tests.

UNIT-II **(8 hours)**

Shallow Foundations: Requirements for satisfactory performance of foundations, methods of estimating bearing capacity, settlements of footings and rafts, proportioning of foundations using field test data, IS codes.

UNIT-III **(8 hours)**

Pile Foundations: Methods of estimating load transfer of piles, settlements of pile foundations, pile group capacity and settlement, negative skin friction of piles, laterally loaded piles, pile load tests, analytical estimation of load- settlement behavior of piles, proportioning of pile foundations, lateral and uplift capacity of piles.

UNIT-IV **(8 hours)**

Well Foundation: IS and IRC Codal provisions, elastic theory and ultimate resistance methods.

UNIT-V **(8 hours)**

Foundations on Problematic Soils: Foundations for collapsible and expansive soil. Case studies

Text Book:

1. Bowles. J.E., “Foundation Analysis and Design”, Tata McGraw-Hill International Edition, 5th Edn, 1997.
2. Das B.M., “Shallow Foundations: Bearing capacity and settlement”, CRC Press, 1999.

Reference Books:

1. Tomlinson M.J., “Pile design and construction Practice”, Chapman and Hall Publication, 1994.
2. Poulos, H. G. and Davis, F. H., “Pile Foundation Analysis and Design”, Wiley and Sons.

RIVER ENGINEERING (CET057)

3L:0T:0P **Credits: 03**

Course objective: This course is aimed at teaching students

1. This course will provide essential knowledge of river hydraulics and its modelling.
2. This will enable the students to apply models of river hydraulics.

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

1. Understand basic concepts related to river systems.
2. Understand and estimate scour near the structures
3. Understand river morphology and perform design of stable channels..
4. Apply mathematical models for assessing response of rivers to different processes.

Course Content

UNIT I: [8 Hours]

Fluvial Geomorphology: Fluvial system, variables for alluvial rivers, regime concept, river classifications, thresholds of river morphology, hydraulic geometry, meander platform, geomorphic analysis of river channel responses.

UNIT II: [12 Hours]

Foundation of Fluvial Process: Hydraulics of flow in river channel, physical properties of sediments, scour criteria and scour-related problems,
Alluvial bed forms and flow resistance, sediment movements in rivers, flow in curved channels.

UNIT III: [10 Hours]

Regime Rivers and Responses: Analytical basis for hydraulic geometry, design of stable alluvial channel, analytical river morphology, plan geometry and processes of river meanders.

UNIT IV: [10 Hours]

Modelling of river channel changes: Mathematical models for erodible channels, gradual breach morphology, tidal responses of river and delta system, fluvial design of river bank protection.

Text Book & Reference Books

1. Garde, R.J., “River Morphology”, New International Publishers., 2006.
2. Garde, R.J. and Ranga Raju, K.G., "Mechanics of Sediment Transportation and Alluvial Stream Problems", Wiley Eastern Limited, 2006.
3. H. Chang, Fluvial Processes in River Engineering, Krieger Pub. , 2001.
4. Chang H. Howard, Fluvial Processes in River Engineering, John Wiley & Sons, 1988.
5. Jansen, P.P.H., “Principals of River Engineering”, VSSD Publications, 1994.
6. Rozovskii L.I. , Flow of Water in Bends of Open Channels, Academy of Sciences of the Ukraine, 1957.

Repair and Rehabilitation of Structure (CET058)

L: T: P:: 3:0:0 **Credits-3**

Course Objectives: To learn various distress and damages to concrete and masonry structures. To understand the importance of maintenance of structures. To study the various types and properties of repair materials. To assess the damage to structures using various tests. To learn the importance and methods of substrate preparation. To learn various repair techniques of damaged structures corroded structures.

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

1. Understand the properties of fresh and hardened concrete.
2. Know the strategies of maintenance and repair.
3. Get an idea of repair techniques.
4. Understand the properties of repair materials
5. Understand the retrofitting strategies and techniques

Syllabus:

UNIT I: **(8 Hours)**

Introduction to Repair and Rehabilitation: Principles of Repair and Retrofitting, Terminology in Repair, Restoration, Strengthening and Rehabilitation, Criteria for Repair, Restoration and Retrofitting.

UNIT II: **(10 Hours)**

Damage assessment and evaluation models: Damage testing methods, Non-destructive testing methods, Seismic Hazard Evaluation, Seismic evaluation of RC building-Demand capacity method, pushover analysis and performance-based approach.

UNIT III: **(8 Hours)**

Repair and retrofitting of masonry buildings: In-situ testing methods for masonry structures, Failure mode of masonry building, Member/Structural level, Repair Materials, Methods of Retrofitting of masonry buildings, Repairing Techniques.

UNIT IV: **(8 Hours)**

Seismic Retrofitting of reinforced concrete buildings : Introduction, In-situ testing methods for RC, Techniques of Repair and Retrofitting in RC buildings Considerations in retrofitting of structures; Source of weakness in RC frame building-Structural damage due to discontinuous load path; Structural damage due to lack of deformation; Quality of workmanship and materials; Classification of retrofitting techniques; Retrofitting strategies for RC buildings -Structural level (global) retrofit methods; Member level (local) retrofit methods; Comparative analysis of methods of retrofitting.

UNIT V: **(8 Hours)**

Methods for Seismic Retrofitting of Structures: Conventional Strengthening Methods, Retrofit of Structures Using Innovative Materials, Base Isolation, Supplemental Energy Dissipation and Structural Control, Effects of Seismic Retrofitting on Structural Performance, Case studies in retrofitting.

Text Books:

1. Earthquake Resistant Design of Structures, S. K. Duggal, Oxford University Press, 2007, 1st Edition.
2. Dynamics of Structures - Theory and Application to Earthquake Engineering, A. K. Chopra, Pearson Education, 2007, 3rd Edition.
3. Earthquake Resistant Design of Structures, P. Agarwal and M. Shrikhande, Prentice Hall Publications, 2006, 1st Edition.
4. Earthquake Resistant design for Engineers and Architects, D. J. Dowrick, John Wiley and Sons, 2009, 2nd Edition.
5. Earthquake Resistant Concrete Structures, Andreas Kappos and G.G. Penelis, Taylor and Francis, 1997, 1st Edition.

ROCK ENGINEERING (CET-059)

3L:0T:0P **Credits: 03**

Course Objectives: The objectives of this course are to impart knowledge and abilities the students to:

1. To understand of the mechanical behaviour of rock materials, rock discontinuities and rock masses.
2. To be able to analyse and to determine mechanical and engineering properties of rocks for engineering applications.

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

1. Able to determine the required rock properties and classify rock mass.
2. Determination of bearing capacity of rocks.
3. Checking the stability of slopes, and design underground and open excavation.
4. The students will be able to predict strength of rock mass with respect to various Civil Engineering applications.

Syllabus:

UNIT-I **(8 hours)**

Engineering Classification of Rocks: Classification of intact rocks, Rock mass classifications, Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Norwegian Geotechnical Classification (Q-system), Strength and modulus from classifications, Classification based on strength and modulus and strength and fracture strain, Geoengineering classification.

UNIT-II **(8 hours)**

Slope design: Basics mechanics of rock and spoil slope failures; Parameters for stability analysis; Design of slopes; Reinforcement of rock slopes and monitoring of slopes Design of mine excavations like drifts, shafts and stopes; Pillar design; Theories of roof failures of small and large excavations;

UNIT-III **(8 hours)**

Strength, Modulus and Stresses-Strain Responses of Rocks: Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure, Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks,. Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Visco-elastic, Elasto-viscoplastic stress-strain models.

UNIT-IV **(8 hours)**

Introduction to Rock Slopes: Introduction to Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, buckling failure, Toppling failure, Improvement of slope stability and protection.

UNIT-V **(8 hours)**

Rock reinforcement: Estimation of support requirements of underground excavation. Mining subsidence, bumps and rock burst, stressing to control rock bursts Mechanics of rock breakage in blasting; Influence of rock properties; Controlling damage.

Text Book:

1. Goodman – Introduction to Rock mechanics, Willey International
2. Ramamurthy, T. – Engineering in Rocks for slopes, foundations and tunnels, Prentice Hall of India (2007)

Reference Books:

1.Jaeger, J. C. and Cook, N. G. W. – Fundamentals of Rock Mechanics, Chapman and Hall, London. (1979)

2.Hoek, E. and Brown, E. T. – Underground Excavation in Rock, Institution of Mining and Metallurgy, 1982.
3.Brady, B. H. G. and Brown, E. T. – Rock Mechanics for Underground Mining, Chapman and Hall, 1993.

Construction Equipment and Automation (CET060)

3L:0T:0P **Credits:03**

Course Objectives: The objectives of this course are to impart knowledge about the use of various Equipment's and Automation.

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

1. To derive feasibility of specific equipment in different project conditions.
2. To selection of automation techniques in construction industry of sub and super structure.
3. To perform the depreciation analysis for constructions equipment.
4. To manage the execution of construction of highways construction work

SYLLABUS:

UNIT-I **(8 hours)**

Sub Structure Construction and Equipment: Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques -Dewatering and stand by Plant equipment for underground open excavation. Excavating Equipment: Power shovels, Draglines, Hoes, Clam shells and trenching machines, Pile boring / driving equipment, Tunnel Boring machines

UNIT-II **(10 hours)**

Super Structure construction and Equipment: Form work for R.C.C. Wall, slab, beam and column, centering for arches of large spans and dams, design features for temporary works, slip formwork, false work for Bridges, Construction of tall structures-Materials of tall structures. Structural system for tall structures. Methods of construction of tall structures. Fabrication and erection of steel trusses and frames. Demolition of Structure: Demolition, taking down, dismantling, methods, safety. Equipment's-Crushers – Feeders - Screening Equipment - Batching and Mixing Equipment - Pouring and Pumping Equipment – Ready mixed concrete carriers, Cranes,

UNIT-III **(10 hours)**

Highway Construction Practice and Equipment: Embankment Construction - Ground improvement techniques, Retaining and Breast walls on hill road. Bituminous Constructions- Concrete road construction: Test - Construction equipment's - Method of construction of joints in concrete pavements - IRC specifications. Fundamentals of Earthwork Operations - Earth Moving Operations-Types of Earthwork Equipment - Tractors, Motor Graders, Scrapers, and Front-end Loaders, Earth Movers – capacity calculations.

UNIT-IV **(6 hours)**

Dams and Harbour Construction Practice: Construction Methods and Equipment for Dams, Harbours, River works and Pipelines.

UNIT-V **(6 hours)**

Equipment Management: Factors affecting selection of equipment and methods –Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment – Depreciation Analysis, Methods of calculation of depreciation- Safety Management.

TEXT/REFERENCE BOOKS:

1. Robert L. Peurifoy, Clifford J. Schexnayder, AviadShapira (2010), Construction Planning, Equipment and Methods, Indian Edition, Mc-Graw Hill-Education, New Delhi.
2. Construction project management: Theory and Practices, 2nd edition, 2016, Kumar Niraj Jha, Pearson Education Publishers.
3. Varghese P.C., (2012), Foundation Engineering, PHI Learning Private Limited, New Delhi.
4. Design of Small Dams- United States Department of the Interior, Bureau of Reclamation revised reprint 1974, Oxford and IBH Publishing Co
5. Irrigation and Water Resources Engineering- Asawa G.L- New Age International (P) Ltd. Publishers, first ed, 2005.