SRI VENKATESWARA UNIVERSITY: TIRUPATI
SRIVENKATESWARAUNIVERSITYCOLLEGEOFENGINEERING
DEPARTMENTOFCIVIL ENGINEERING

Course

B.Tech (CIVILENGINEERING)

Choice Based Credit System (CBCS)

AcademicYear2017-2018

About the Department:

- Established in the year 1959.
- Largest department in the University.
- Well Qualified & Experienced Faculty.
- Meritorious students, Regular conduct of student's activities, Field visits, Internships participation of students in various activities in other Institutions.
- Good Alumni Support
- Faculty actively involved in teaching, research, consultancy and extension programmes and interaction with outside world.

Vision:

Vision of the Civil Engineering Department is to produce globally competitive and committed Civil Engineers with ethical values to cater to the needs of the society and strive for sustainable development through research and innovation.

Mission:

- To impart quality education with the support of state-of-art Infrastructure and Faculty.
- To inculcate inquisitiveness, infuse training and research for the societal development.
- To address growing needs of sustainable infrastructure development.
- To provide technical advice and support to the industry.
- To provide awareness of global economic problems and contribute to Nation building.
- To provide entrepreneurial skills for the upliftment of the country.

PROGRAMME OUTCOMES

POs describe what students are expected to know or be able to do by the time of graduation from the program. ProgramOutcomes areestablishedaspertheprocess described below.

Program Outcomes of B.Tech in Civil Engineering are:

1. To apply knowledge of mathematics, Science, Engineering fundamentals, and engineering specialization for the solution of complex engineering problems.
2. To identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. To design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. To use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
5. To create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
6. To apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. To understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. To apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. To communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. To demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. To recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

a. To provide students with the fundamental, technical knowledge and skills in mathematics, sciences and engineering to recognize, analyze and solve complex problems in the areas of Structural, Geotechnical, Hydraulics and Water Resources, Transportation and Environmental engineering.
b. To provide students with individual working skills and practical experience and to fulfill their professional duties and communicate effectively in teamwork, ethical thinking, technical leadership, and lifelong learning.
c. To make the students responsible professionals to work in various positions in industry or government and/or succeed in graduate or other professional organizations.
d. To train the students to become engineers, managers, scientists, researchers and innovators and make substantial contributions to the society.
e. To guide the students to use modern tools to solve complex engineering problems
f. To make the students to strive for the improvement of the quality of life and improve the standard of living by providing environmental sustainability.

PROGRAMME SPECIFIC OUTCOMES (PSO'S)

PSO1: Specify, Design, test and evaluate foundations and super structure for residences, public buildings, industries, irrigation structures, transportation amenities and environmental Engineering systems.

PSO2: Development of state of art skills for using modern tools, as entrepreneur in the domain field or in multidisciplinary environment.

FIRST SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
MAT01	Engineering Mathematics – I	3	2		5	Basic	4
CST01	Computer Programming	3	2		5	Basic	4
CET01	Environmental Studies	2	2		4	Basic	3
PHT01	Engineering Physics	3			3	Basic	3
CYT01	Engineering Chemistry	3			3	Basic	3

MET01	Engineering Graphics	2		3	5	Basic	4
CSP01	Computer Programming Lab			3	3	Basic	2
MEP01	Workshop Practice			3	3	Basic	2
		16	6	9	31		25

S.V. UNIVERSITY COLLEGE OF ENGINEERING :TIRUPATI – 517502

4-Year B.TechDegree Programme

MAT01 Engineering Mathematics – I

Instruction Hours / Week : 5 **Credits: 4**

Common to all branches and with effect from 2016-17

Course Objectives:

1. The emphasis is primarily on the development of analytical techniques.
2. To make students familiar with Differential Equations and its solutions.
3. To provide the basic knowledge in transformations and in particular Laplace transforms
4. Expansions of functions as a power series
5. Roll's and Mean value theorems and maxima, minima
6. Curve tracing and Evaluation of Multiple Integrals

Syllabus

Unit – 1
Differential Equations: Linear differential equations of second and higher order with constant coefficients-particular integrals-homogeneous differential equations with variable coefficients-method of parameters-simulation equations.

Unit – 2
Laplace Transforms I: Laplace transforms of standard functions-inverse transforms-transforms of derivatives and integrals-derivatives of transforms-integrals of transforms.

Unit – 3
Laplace Transforms II: Transforms of periodic functions-convolution theorem-applications to solution of ordinary differential equations.

Unit – 4

Calculus: Roll's and Mean value theorems - Taylor's and Maclaurins's series-maxima and minima for functions of two variables - Infinite series - Convergence Tests series of positive terms - comparison, Ratio tests - Alternating series - Leibnitz's rule - Absolute and conditional convergence.

Unit – 5

Multiple Integrals: Curve tracing (both Cartesian and polar coordinate) - Evaluations of double and Triple integrals-change of order of integrations-change of variables of integrations-simple applications to areas and volumes.

Text Books:

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
4. Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

Course Outcomes:

1. Extends an ability to analyze differential equations and solve them
2. The students become familiar with the applications of differential equations to engineering problems.
3. In Mathematics, a transform is usually a device that converts one type into another type presumably easier to solve.
4. Use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
5. Solve an initial value problem for an n^{th} order ordinary differential equation using the Laplace transform.
6. Expand functions as power series using Maclaurin's and Taylor's series
7. The problems in OR, Computer science, Probability, statistics deals with functions of two or more variables. To optimize something means to maximize or minimize some aspects of it.
8. Curve tracing is an analytical method of drawing an approximate shape by the study of some of its important characteristics such as symmetry, tangents, regions etc it is useful in applications of finding length, area, volume.
9. Multiple integral is a natural extension of a definite integral to a function of two, three variables and are useful in evaluating area and volume of any region bounded by the given curves.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											
CO2		2			2							
CO3			3	1								
CO4			1									
CO5					3	2						
CO6												
CO7												
CO8												
CO9												

3-High, 2- Medium, 1- Low.

CST01 Computer Programming

Instruction Hours / Week: 5 **Credits: 4**

Common to all branches and with effect from 2016-17

Prerequisites:

1. There are no prerequisites for this course, except that anyone who wants to learn C as well as should have analytical skills and logical reasoning.

Course Objectives:

1. This course starts from the basics of program development.
2. To understand the various steps in Program development
3. It covers various concepts of C and C++ programming languages
4. To learn how to write modular and readable C Programs
5. To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
6. To understand the notations used to analyze the Performance of algorithms.
7. It introduces searching and sorting algorithms
8. To understand and analyze various searching and sorting algorithms

Syllabus

UNIT – I

Introduction to Programming– Problem Solving Steps, SDLC, Algorithms, and flow charts.
Common features of C and C++ Programming Languages – Identifiers, Variables, Constants, data types, Operators and Expressions, Input / Output operations. Statements- Decision Making, Branching and Looping, continue, go to and break. Precedence and Associatively, Expression Evaluation, Type conversions. C and C++ Simple Programming examples

UNIT – II

Arrays and Strings – Concepts, arrays, one and two and multidimensional arrays.Strings Handling: String Input / Output functions, arrays of strings, string manipulation functions, data conversion, C and C++ Simple Programming examples
Designing Structured Programs- Functions- basics, functions, Scope, Storage classes- auto, register, static, extern, scope rules, type qualifiers, recursion, Preprocessor directives.
Derived types – Structures – Declaration, definition and initialization of Structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, type def, bit fields, enumerated types. C and C++ Simple Programming examples

UNIT – III

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, pointers to void, pointers to functions, command –line arguments. C and C++ Simple Programming examples

Data File Handling: Input and Output– Concept of a file, streams, standard input / output Functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (Eq.error handling), C and C++ Simple Programming examples.
Dynamic Memory Allocation: Allocating a Block and Multiple Blocks, releasing the used space and altering memory size. C and C++ Simple Programming examples

UNIT – IV

Basics of Object Oriented Programming (OOP) and **C++:**Benefits of OOP, datatypes, declarations, expressions and operator precedence, scope of variables
Introduction to OOP and Concepts: Abstraction**,** Data hiding, Encapsulation Classes and objects, Constructors & Destructors, Operator overloading & type conversions.
Polymorphism: Pointers, virtual functions and polymorphism- pointers to objects, this pointer, pointers to derived classes, virtual and pure virtual functions, C++ Simple Programming examples

UNIT – V

Inheritance: Derived classes, syntax of derived classes, making private members inheritable, single, multilevel, multiple, hierarchical, hybrid inheritance.
Templates, Exception handling, console I/O andFile I/O:classtemplates,Functiontemplates, member function templates, exception handling, managing console I/O operations, working with files. Programming guide lines and Simple C++ Programming examples

TEXT BOOKS:

1. Scheldt H, C: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2002.
2. Balagurusamy E, Programming in ANSI C, 4th Edition, Tata McGraw-Hill, 2008
3. Robert Lefore, Object Oriented Programming in C++, 4th edition, PEARSON Education
4. Scheldt H , C++ : The Complete Reference, Tata McGraw-Hill

REFERENCES:

1. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
2. Programming in C – Stephen G. Kochan, III Edition, PearsonEductaion.
3. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
4. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J.Augenstein, Pearson Education / PHI
5. C Programming & Data Structures, P. Dey, M Ghosh R Thereja,Oxford University Press

6. C & Data structures – E V Prasad and N B Venkateswarlu, S.Chand& Co
7. Kernighan and Ritchie, The C programming language (2nd edition). Prentice Hall of India, 1988.
8. Coohoon and Davidson, C++ Program Design: An introductionto Programming and Object-Oriented Design. Tata McGraw Hill3rd edition. 2003.
9. G. Dromey, How to Solve it by Computer, Prentice-Hall Inc.,Upper Saddle River, NJ, 1982.Yashwant Kanetkar, Let's C, Allied Publishers, 1998.
10. Programming in C, PradipDey, ManasGhosh, Second Edition, OXFORD

Course Outcomes:

1. Able to design the flowchart and algorithm for real world problems
2. Able to learn and understand new programming languages
3. Able to construct modular and readable programs
4. Able to write C and C++ programs for real world problems using simple and compound data types
5. Adapt programming experience and language knowledge to other programming language contexts
6. Good programming style, standards and practices during program development

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

1. Develop C and C++ programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings; and data structures like stacks, queues and linked lists. Managing classes and Objects
2. Implement searching and sorting algorithms

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									
CO2	1			2	2							
CO3			2	3		1						
CO4		1		2								
CO5			2	2	1							
CO6												

CET01 Environmental Studies

Instruction Hours / Week :4 **Credits: 3**

Common to all branches and with effect from 2016-17

Course Educational Objective (CEOs):

1. To Impart basic knowledge about the environment and its allied problems
2. To apply knowledge in Economic development without destroying the environment
3. To have knowledge on renewable energy and non renewable energy sources
4. To know about the bio diversity and its concepts

Unit I **Environmental Studies and Natural Resources**

Definition, Scope and importance of Environment, Environmental studies, Need for public awareness

Components of Environment- Atmosphere, Hydrosphere, Lithosphere.

Renewable and **Non Renewable Resources and associated problems**

- Water resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- Forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Land resources: Land as a resource, land degradation, Man induced landslides, soil erosion and desertification.
- Mineral resources: Use and overexploitation, Environmental effects of extracting and using mineral resources, case studies.
- Food resources: World food problems, changes caused agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, Case studies.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- Role of an individual in conservation of natural resources.

Unit II **Ecosystem and Biodiversity :**

Ecosystem - Concept of an ecosystem.

1. Structure and functions of an ecosystem.
2. Producers, consumers and decomposers.
3. Energy flow in the ecosystem.
4. Ecological succession.
5. Food chains, food webs and ecological pyramids.
6. Introduction, types, characteristic features, structure and function of the following ecosystem.
   (a) Forest ecosystem. (b) Grassland ecosystem
   (c)Desert ecosystem. (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation:

- Definition, genetic species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit III Environmental pollution and Global Effects.

- Definition, Causes, Effects, and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: Floods, earthquakes, cyclone, landslides, Tsunami.
- Climate change-Global warming, Acid rain, Ozone depletion,.

Unit IV Environment Issues and Management

- Environment and Human health – Epidemic diseases, HIV/AIDS, Aviation Flue, Water Borne Diseases.
- Environmental Impact Assessment, Sustainable Development, Clean Production and Clean Development Mechanisms
- Environment Legislation: Environmental Protection Act, Water Act, Air Act, Wild Life Protection Act, Forest Conservation Act, Public Liability & Insurance Act, Issues involved in Enforcement of Environmental legislation.

Unit V Social Issues and the Environment

- Population growth, Population Explosion, Population Control, Women and Child welfare.
- Urbanization, Industrialization, Development projects, Resettlement and Rehabilitation of people – Problems concerned, Case studies.
- Consumerism and Waste Products Conservation, Public Awareness, Water Conservation, Rain water harvesting, watershed management, Wasteland reclamation, Human Rights, Value education, Environmental ethics- Issues and possible solution.
- Role of information Technology in Environment and Human Health.

Text books :

1. AnubhaKaushik& C P Kaushik, Environmental studies, New age International Publishers, 2008
2. Benny Joseph, Environmental studies, Tata McGraw-Hill Publishers, 2005
3. M Chandra Sekhar, Environmental Science, Hi-Tech Publishers, 2004
4. Keerthinarayana and Daniel Yesudian, Principles of Environmental Sciences and Engineering , Hi-Tech Publishers, 2005
5. AmalK.Datta, Introduction to Environmental Science and Engineering, Oxford & IBH Publishing Co.Pvt.Ltd, 2000
6. SanthoshkumarGarg,RajeshawriGarg and RajniGarg, Ecological and Environmental studies, Khanna publishers, 2006

Reference books:

1. Gilbert M, Introduction to Environmental Engineering and Science, Masters Publication by Prentice –Hall of India Private Ltd., 1991
2. William P Cunningham and Mary Ann Cunningham, Principles of Environmental Science, Tata McGraw Hill Publishing Co.Ltd, 2002

Course Outcomes:

On successful completion of this course the students will be able to:

1. Acquire knowledge in

- Diverse components of environment and natural resources
- Ecosystem and biodiversity & its conservation methods
- Population growth and human health
- Green technology

2. Identify and resolve the issues related to sources of different types of pollutions
3. Provide solutions to individuals, industries and government for sustainable development of natural resources
4. Apply environmental ethics in protection of diversified ecosystems.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1					2	2	1				2
CO2	1					1	2	1				2
CO3						2	2	3				
CO4			1			2		1				1

PHT01 Engineering Physics

Instruction Hours / Week : 3 **Credits: 3**

Common to all branches and with effect from 2016-17

Course Objectives:

1. To make students aware of basic crystallographic geometry, defect studies and estimation of crystal structure by diffraction techniques.
2. To provide students with sound knowledge of basic principles of quantum Mechanics and its applications in problem solving.
3. To understand the concept of electrical conductivity by classical and quantum free electron theories and distinguishing materials based on band theory of solids.
4. Basic principles of laser optics and applications and ultrasonics.
5. Quantum confinement and size dependent properties of nanomaterials, their synthesis and applications.

Syllabus

UNIT-I

Crystallography : Unit Cell – Bravais Lattice – Crystal systems – Crystal packing – Close Packed Structures – NaCl, ZnS and Diamond – Miller Indices – Bragg`s Law –Bragg`s Spectrometer and Crystal Structure determination – Defects in crystal Structure – Point Defects and Line Defects .

UNIT – II

Quantum Mechanics : Wave – Particle duality – de Broglie Concept of Matter Waves – Properties of Matter Waves – Davison and Germer Experiment – G.P.Thomson Experiment – Heisenberg's Uncertainty Principle – Schrödinger's Time Independent and Time Dependent Wave equation – Significance of Wave Function – Electron in an Infinite Square Potential Well – Probability Densities and Energy Levels.

UNIT – III

Band Theory of Solids : Classical Free Electron Theory of Metals – Success and Failures – Quantum Free Electron Theory – Fermi Factor – Electron in Periodic Potential – Bloch Theorem – Kronig – Penney Model – Distinction between Metals , Insulators and Semiconductors – Intrinsic and Extrinsic Semiconductors – Hall Effect.

UNIT – IV

Lasers : Introduction – Spontaneous and Stimulated emissions – Population Inversion – Types of Lasers – Ruby Laser – He-Ne Laser – Semiconductor Laser – Applications of Lasers.

Ultrasonics : Introduction – Production of Ultrasonic Waves by Magnetostriction and Piezoelectric methods – Detection and Applications of Ultrasonic Waves.

UNIT – V

NanoPhysics and Nanotechnology : Introduction to Nanomaterials –Properties: Optical Properties – Quantum Confinement – Electrical properties. Synthesis of Nanomaterials: Ball milling, Arc deposition method – Chemical Vapour Deposition-Pulsed laser deposition. Characteristics of C^{60} (Zero dimensional), Carbon Nanotubes (One Dimensional) and Graphene(Two Dimensional). Applications of Nanomaterials.

Text Books:

1. R.K.Gaur and S.L.Gupta ``Engineering Physics" Sultan and Chand Pub., New Delhi
2. S.P.BasavaRaju `` A Detailed Text Book of Engineering Physics" Sole Distributers, Subhash Stores Book Corner, Bangalore
3. HitendraK.Malik and A.K.Singh ``Engineering Physics" Tata MCGraw Hill Education PVt.Ltd., New Delhi
4. G.Senthil Kumar, `` Engineering Physics'' VRH Publishers Pvt. Ltd, Hyderabad
5. M.S.RamachandraRao and Shubra Singh, ``Nanoscience and Nanotechnology`` Wiley IndiaPvt.Ltd, New Delhi

Refrence Books

6. John Allison, ``Electronic Engineering Materials and Devices" Tata McGraw Hill Publications.
7. B.L Theraja, "Modern physics", S.Chand& Company.
8. V. Raghavan "Material Science", Tata McGraw Hill Publications.

Course Outcomes:

1. Students demonstrate appropriate competence and working knowledge of laws of modern physics in understanding advanced technical engineering courses.
2. Ability to understand the crystal geometries and estimation of crystal structure by X-ray diffraction techniques.
3. Students demonstrate the ability to identify and apply appropriate analytical and mathematical tools of physics in solving engineering problems.
4. Students demonstrate the ability to apply knowledge of band theory in the area of electronics and understanding the basic electron transportation phenomenon in micro devices.
5. Student's ability to understand the principles in the production and applications of lasers and their effective utilization in optical communication and detection.
6. Students demonstrate the ability to understand size depended properties of nano dimensional materials and their effective utilization in making nano and micro devices for further microminiaturization of electronic devices.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2									
CO2	2		2	2								
CO3		1		2	2							
CO4			2	2	3							
CO5		1	1	2								
CO6												

CYT01 Engineering Chemistry

Instruction Hours / Week : 3 **Credits: 3**

Common to all branches and with effect from 2016-17

Course Objectives:

1. To provide the information regarding hardness of water, effects of hard water in boilers and treatment methods to avoid bad effect on human health. And also to check the parameters of various water samples by experimental techniques.

2. To make students familiar with importance of electrochemical processes in nature and industry, like the coating of objects with metals or metal oxides through electro deposition, also to provide the information about new technological solar batteries.

3. To provide knowledge on the fuel properties to help in selecting good fuel for reducing the pollution based on its efficiency without much smoke and also to make aware of synthetic fuels.

4. To make aware of the design synthesis and analysis of polymers and their multi-faceted applications in Engineering, Airplane engineering and bio-medical engineering.

5. To make aware of compounding and processing of polymers and description of major polymers, structure property relations and application and to provide their relevance in the electric and electronic fields.

6. To provide the knowledge of manufacturing of cement and analysis of cement and also the classification and properties of refractories and ceramics.

Syllabus

UNIT-I:

WATER TREATMENT: Introduction – Effect of water on rocks and minerals – hardness of water – disadvantages of hard water – boiler feed water – scale and sludge formation in boilers – caustic embrittlement – boiler corrosion – priming and foaming – softening methods-lime soda, zeolite and ion exchange process-Specification of potable water and purification of Drinking water – chemical analysis of water-Hardness, acidity, alkalinity, chloride and dissolved oxygen.

UNIT –II:

ELECTRO CHEMISTRY AND CORROSION: Electrode potential – reference electrodes – hydrogen, calomel and glass electrode – PH and its determination –batteries – fuel cells – aluminum air battery – solar battery – lead acid storage cell.-Corrosion: Types of corrosion – factors influencing corrosion – theories of corrosion – prevention of corrosion – cathodic protection – metallic coatings – hot dipping, spraying, cementation, cladding and electro plating.

UNIT –III:

FUELS AND COMBUSTION: Introduction – classification of fuels – calorific value and its determination – bomb calorimeter – Boy's gas calorimeter – theoretical calculation of calorific value of fuel – coal – analysis of coal – metallurgical coke – petroleum –refining of petroleum-synthetic petrol – octane and cetane number– combustion – mass analysis from volume analysis and vice versa – analysis of flue gas by Orsat's apparatus.

UNIT –IV:

HIGH POLYMERS: Nomenclature of polymers – types of polymerization-Plastics – classification of plastics – moulding constituents of plastics– preparation, properties and applications of polythene, nylon, Teflon, and bakelite – Rubbers – vulcanization of rubber –compounding of rubber- synthetic rubbers-buna-N, thiocol and silicon rubbers- Lubricants-classification-mechanism-properties of lubricating oils-selection of lubricants for engineering applications.

UNIT–V:

BUILDING MATERIALS: Manufacture-dry and wet processes-setting and hardening of cement-analysis of cement. Refractories-classification-properties and engineering applications. Ceramics-classification-properties and engineering applications

Books Recommended:

1. Engineering Chemistry : PC Jain & M Jain-Dhanpatrai publishing company, New Delhi
2. Engineering Chemistry : BK Sharma
3. Engineering Chemistry : SS Dhara
4. Physical Chemistry : Puri& Sharma-Vishal PulishingCompany(VPC), Jalandhar
5. Physical Chemistry : Bahl&Tuli-

6 Polymer Science- :Gowarikar-

7 Physical Chemistry by : Glasstone-

Course Outcomes:

1. To understand the importance of the water and its quality
2. To identify uses of electrochemical processes in nature and industry
3. To understand properties of good fuel for reducing auto exhaust gases to the environment
4. To understand synthesis, properties and engineering applications of polymers
5. To know the procedure and analysis of cementing materials

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1				2	2					1
CO2		1		2		1	1					
CO3		2			1		2					2
CO4				1	1		2					
CO5	1			1	2		1					

MET01 Engineering Graphics

Instruction Hours / Week : 5 **Credits: 4**

Common to all branches and with effect from 2016-17

Course Objectives:

1. Students are to learn fundamentals of engineering graphics as it applied to basic engineering core course.
2. To provide the knowledge of construction of basic scales, conics, ellipse, parabola and hyperbola.
3. To impart knowledge about the construction of Cycloidal curves.
4. To understand the concepts of first angle and third angle projections of drawing.
5. To understand the concepts of projections of plane surfaces, solids, cylinders and cones.
6. To have thorough understanding of sections of solids and orthographic projections.

Syllabus

UNIT-I

Scales, plane scale, diagonal scale Practices
Conics- construction of Ellipse, parabola and Hyperbola by eccentricity method
Ellipse- Concentric circles and Oblong methods, Rectangular hyperbola

UNIT-II

Construction of cycloidal curves- epi cycloid and hypocycloid, Involutes- Circle, Polygon

UNIT-III

Projection of points-Principles of Projections, First and Third angle projections, projections of points
Projection of Lines- Projection of straight Lines, lines inclined to one plane and parallel to the other, Lines inclined to both planes, True length and true inclinations, Location of traces

UNIT-IV

Projection of Plane surfaces and solids-Projection of Polygonal surfaces and circular lamina inclined to both planes. Projection of right regular solids- Projection of simple solids such as Prisms, Pyramids, Cylinders and Cones with their axes perpendicular to anyone of the Principal planes and inclined to the other.

UNIT-V

Section of Solids- Sections of above solids in simple vertical position resting on their base, by cutting planes inclined to one reference plane and perpendicular to the other-True shape of the sections.
Orthographic Projections- Conversion of Pictorial views into orthographic views of simple objects.

Text Books:

1. **Bhatt N.D. and V.M. Panchal,** Engineering Drawing Revised Edition, Charotar Publications, 2001.
2. **Dhananjaya A Jolhe,** Engineering Drawing with an introduction to Auto CAD, Tata MeGrawhill - 2009
3. **K.L.Narayana and P. Kannaih,** A text Book of Engineering Drawing, Scitech Publications – 1999.
4. **Venugopal,K.,** Engineering Drawing and Graphics, New Age International Publishers

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

1. Make a distinction between first angle projection and third angle projection of drawing.
2. Draw hyperbola, parabola, Involutes and Cycloidal curves.
3. Draw sections of solids including cylinders, cones, prisms and pyramids.
4. Draw projections of lines, planes, solids and sections of solids.
5. Draw orthographic projections of lines, planes, and solids.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1			1	1					
CO2	2	1				1	1					
CO3		2		2		2						1
CO4			1	2			1					
CO5		1		2		3						

CSP01 Computer Programming Lab

Instruction Hours / Week : 3 **Credits: 2**

Common to all branches and with effect from 2016-17

Course Objectives:

1. To work with the compound data types
2. To explore dynamic memory allocation concepts
3. Able to design the flowchart and algorithm for real world problems
4. Able to write C and C++ programs for real world problems using simple and compound data types
5. Employee good programming style, standards and practices during program development

Syllabus

1. **C and C++ Programming Languages shall be used for Implementation of the following Programs.**
2. **The following List is not exhaustive, The instructor changes the problems and number of programs for continuous evaluation Teaching Learning Process**

Week-1
1) Write a C program to make the following exchange between the variables a-> b -> c->d - > a
2) Write a C program to carry out the arithmetic operations addition, subtraction, multiplication, and division between two variables
3) Write a C program for printing prime numbers between 1 and n.

Week-2
1) Write a C program to construct a multiplication table for a given number.
2) Write a program to reverse the digit of a given integer.
3) Write a C program to find the sum of individual digits of a positive integer.
4) Write a C program to calculate the factorial of a given number

Week-3
1) Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
2) Write a program to calculate tax, given the following conditions:
   a) If income is less than 1, 50,000 then no tax.
   b) If taxable income is in the range 1,50,001 – 300,000 then charge 10% tax
   c) If taxable income is in the range 3,00,001 – 500,000 then charge 20% tax
   d) If taxable income is above 5,00,001 then charge 30% tax

Week-4
Write a program to print the calendar for a month given the first Week- day of the month.

Input the first day of the month (Sun=0,Mon=1,Tue=2,Wed=3,…..) :: 3

Total number of days in the month : 31

Expected output

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
-	-	-	*1*	*2*	*3*	*4*
5	*6*	*7*	*8*	*9*	*10*	*11*
12	*13*	*14*	*15*	*16*	*17*	*18*
19	*20*	*21*	*22*	*23*	*24*	*25*
25	*26*	*27*	*28*	*29*	*30*	*31*

2) Write a C program to find the roots of a quadratic equation

Week-5
1) Write a program to print the Pascal triangle for a given number
2) Write a C program to find the GCD (greatest common divisor) of two given integers
3) Write a C program to construct a pyramid of numbers.
4) Write C code to define a function cash_dispense, which takes an amount as its input, and returns the number of 1000, 500, 100, 50, 20, 10, 5, 2, 1 rupee denomination that make up the given amount

Week-6

1) Write C code to reverse the contents of the array. For example, [1,2,3,4,5] should become [5,4,3,2,1]
2) Write a C program that uses functions to perform the following:
   i) Addition of Two Matrices
   ii) Multiplication of Two Matrices
3) Write a program that will search and find out the position where the given key element exist in a user chosen array and print it as output.

Week-7

1) Write C code to compute the frequency table of survey responses given by 20 users. The survey responses range from 1 to 5 and are stored in an array. For example, 10 responses are stored in the array [1,1,5,2,3,3,5,5,2,2]. The frequency table will be as shown below:
   a. 1 = 2
   b. 2 = 3
   c. 3 = 2
   d. 4 = 0
   e. 5 = 3
2) Write a program to define a function to sort an array of integers in ascending order by using exchange sort.

Week-8

1) Write a C program to check whether a given string is a palindrome or not, without using any built-in functions.
2) Write a C program to determine if the given string is a palindrome or not by using string functions.
3) Write a function that accepts a string and delete the first character.
4) Write a function that accepts a string and delete all the leading spaces.

Week-9 Write a program to accept a string from user and display number of vowels, consonants, digits and special characters present in each of the words of the given string.

Week-10

1) Write a C program to define a union and structure both having exactly the same numbers using the sizeof operators print the sizeof structure variables as well as union variable
2) Declare a structure *time* that has three fields *hr, min, secs*. Create two variables, *start_time* and *end_time*. Input there values from the user. Then while *start_time* is not equal to *end time* display GOOD DAY on screen.

Week-11

1) Write a program to read in an array of names and to sort them in alphabetical order. Use sort function that receives pointers to the functions strcmp, and swap, sort in turn should call these functions via the pointers.
2) Write a program to read and display values of an integer array. Allocate space dynamically for the array using the *malloc()*.
3) Write a program to calculate area of a triangle using function that has the input parameters as pointers as sides of the triangle.

Week-12

1) Two text files are given with the names text1 and text2. These files have several lines of text. Write a program to merge (first line of text1 followed by first line of text2 and so on until both the files reach the end of the file) the lines of text1 and text2 and write the merged text to a new file text3.

2) Write a program to split a given text file into n parts. Name each part as the name of the original file followed by .part<**n**> where n is the sequence number of the part file.

Reference Books:

1. Computer Science, A Structured Programming Approach Using C by Behrouz A. Forouzan& Richard F. Gilberg, Third Edition, Cengage Learning
2. C Programming A Problem-Solving Approach, Behrouz A. Forouzan& E.V. Prasad, F. Gilberg, Third Edition, Cengage Learning
3. Programming with C RemaTheraja, Oxford
4. "C Test Your Skills", Kamthane, Pearson Education
5. Programming in C: A Practical Approach, Ajay Mittal, Pearson
6. Problem solving with C, M.T.Somasekhara, PHI
7. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press
8. Programming withc, Byron S Gottfried, Jitender Kumar Chhabra, TMH, 2011

Course Outcomes:

1. Able to have fundamental concept.
2. Able to write, compile and debug programs in C language.
3. Able to formulate problems and implement algorithms in C.
4. Able to effectively choose programming components that efficiently solve computing problems in real-world.
5. Able to use different data types in a computer program.
6. Able to design programs involving decision structures, loops and functions.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3		2		1		2	1	
CO2	3	3			2			3		2		3
CO3	3	3		2	2	1			1		3	
CO4	3	3		3		2		2		3		
CO5	3	2			3		3		3		1	
CO6												

MEP01 Workshop Practice

Instruction Hours / Week : 3 **Credits: 2**

Common to all branches and with effect from 2016-17

Course Objectives:

1. To impart training to the students in different crafts of workshop.
2. To make known about the importance of Carpentry, Welding in our daily life.

3. To identify what are runners, risers in a foundry shop, and welding equipment used in Gas welding and Arc welding.
4. To identify different smithy tools used in tin smithy.

Syllabus

Carpentry

Wood sizing exercise in planning, marking, sawing, chiseling and grooving to prepare

1. Half – lap joint
2. Dove – tail joint
3. Tenon joint

Fitting

Markings, cutting and filing to prepare

1. Straight fitting
2. V – fitting
3. Square fitting

Tinsmithy

Markings, bending and cutting to prepare

1. Round tin
2. Square tin

Foundry

Ramming and placing of riser and runner to prepare the moulds for the following

1. Two – stepped pulley
2. Three – stepped pulley
3. Dumbell

Welding

Preparation of

1. Lap joint
2. Butt joint
3. T – joint

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

1. Prepare different types of joints by means of wood, i.e., wood working.
2. Prepare sand moulds by means of wooden patterns.
3. Identify different and prominent tools used in various sections of workshop.
4. Make a distinction between Lap, Butt and T – joints in welding processes.
5. Perform markings, cutting, and filing on steel specimens by fitting tools.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		1		1	1						1
CO2	1		2		2	2						
CO3		1		3	3	2						
CO4			1	2	2							1
CO5			1		2	2						1

SECOND SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
MAT02	Engineering Mathematics – II	3	2		5	Basic	4
CST02	Data Structures	3	2		5	Basic	4
EET01	Basic Electrical Engineering	3			3	Basic	3
ECT01	Basic Electronics Engineering	3			3	Basic	3
CET03	Branch Subject	4			4		4
ENT01	English	3			3	Basic	3
CSP02	Data Structures Lab			3	3	Basic	2
ENP01	English Communication Lab			3	3	Basic	2
		19	4	6	29		25

MAT02 Engineering Mathematics – II

Instruction Hours / Week : 5 **Credits: 4**

Common to all branches and with effect from 2016-17

Course Objectives:

1. Rank of a matrix, Eigen values, Eigen vectors- Cayley Hamilton theorem- Quadratic forms- diagonalization
2. Gradient of a scalar, Divergence, Curl of a vector and related properties- line, surface, volume integrals Green's, Stokes' and Gauss divergence theorems and its applications.
3. Fourier Series- Harmonic analysis
4. Gamma and Beta Functions
5. Bessel function and Legender Polynomials

Syllabus

Unit – 1

Matrices: rank of a matrix-solution of system of linear equations-eigenvalues,vectors-cayley-hamilton theorem-quadratic forms-diagonalization.

Unit – 2

Vector Calculus: Gradient, Divergence, Curl of a vector and related properties-line, surface, volume integrals- Green's, Stokes's and Gauss Divergence theorems and its applications.

Unit – 3

Fourier Series: Fourier series-even and odd functions, periodic functions-half range sine and cosine series-harmonic analysis.

Unit – 4

Special Functions I: Gamma and Beta functions-series solutions of differential equations-ordinary points.

Unit – 5

Special Functions II: Bessel function-recurrence formulae-generating function for $J_n(X)$-Lengender polynomials-recurrence formulae-generating function for $P_n(X)$ - Rodrigue's formula - orthogonality of Lengender polynomials.

Text Books:

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
4. Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

Course Outcomes:

1. Use ranks of matrices to decide whether the system of linear equations is consistent or not and hence solve.
2. Use Cayley-Hamilton theorem to find inverses or powers of matrices.
3. Use Eigen values and vectors to reduce Quadratic forms to normal form.
4. Ability to analyze motion problems from real lines to curves and surfaces in 3-D. Use tools such as divergence and curl of vector and gradient, directional derivatives that play significant roles in many applications.
5. To use Green's theorem to evaluate line integrals along simple closed contours on the plane

6. To use Stokes' theorem to give a physical interpretation of the curl of a vector field
7. To use the divergence theorem to give a physical interpretation of the divergence of a vector field.
8. Find the Fourier series representation of a function of one variable. It is representation of a function as a series of constants times sine and cosine functions of different frequencies in order to see periodic phenomenon have long fascinating mankind.
9. Evaluation of certain improper integrals is made simple with introduction of Gamma and Beta functions

10. Primary motivation for studying certain special functions is that they arise in solving certain ordinary differential equations that model many physical phenomenon. They constitute necessary items in the toolkit of anyone who wishes to understand the work with such models.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	3		1			2		3	
CO2	2	3	3		3		1					2
CO3		1				2		2				
CO4	1	3		3				1				
CO5	3		3		2			2				
CO6												
CO7												
CO8												
CO9												
CO10												

CST02 Data Structures

Instruction Hours / Week : 5 **Credits: 4**

Common to all branches and with effect from 2016-17

Course Objectives:

1. To develop skills to design and analyze linear and nonlinear data structures.
2. Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3. Develop recursive algorithms as they apply to trees and graphs.
4. To get acquaintance with frequently used data structures in Software Engineering and Programming practices.
5. To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
6. To develop a base for advanced computer science study.

Syllabus

UNIT I

Definitions of Data structures, Storage Structures and File Structures.Primitive and Non-primitive Data Structures, Linear and Nonlinear Data Structures.
Performance Analysis, Asymptotic Notation and Performance Measurement.
Linear Lists - ADT, Array Representation, Linked Representation and applications.

UNIT II

Stacks: Definition, The Abstract Data Type, Array Representation, Linked Representation.
Queues: Definition, The Abstract Data Type, Array Representation, Linked Representation, Circular Queues, Applications. Linked Lists: Single Linked Lists – Insertion and Deletion, Double Linked Lists – Insertion and Deletion.
Skip List and Hashing: Dictionaries, the ADT of Skip List, Linear List Representation, Hash Table Representation.

UNIT III

Binary Trees - Definition and Properties, ADT, Array Representation, Linked Representation, and Applications.Heap- Definition and Applications.
Binary Search Trees - Definition, ADT, Implementation and Applications.
Introduction to Balanced Search Trees - AVL Trees, Red-Black Trees, and Splay Trees.

UNIT IV

Graphs - Definition and Properties, Modeling Problems as Graphs, ADT, Representations, Breadth First Search and Depth First Search. Priority Queues: Definition and Applications, Single and Double Ended Priority Queues, Linear Lists, Heaps, Leftist Trees, Binomial Heaps, Fibonacci Heaps, Pairing Heaps
Introduction to Algorithms for Solving Problems: Minimum Spanning Tree, Single Source Shortest Paths, All-Pairs Shortest Paths, and Maximum Flow.

UNIT V

Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees, Red – Black Trees, Splay Trees. Multiway Search Trees: m – way Search Trees, B – Trees, B+ - Trees
External Searching -Concepts of Simple Indexing, Multilevel Indexing, B- Trees, B+ Trees, Static Hashing, Collision Resolution Techniques, Packing Density, Bucket Size and Extendible Hashing.

Text Books:

1. Sahni S, Data Structures, Algorithms and Applications in C++, 2nd Edition, Universities Press, 2005.
2. Malik D S, Data Structures using C++, Cengage Learning, 2003.
3. Fundamentals of Data Structures in C++ by Ellis Horowitz, SartajSahni, Dinesh Mehta, Universities Press, Second Edition.

REFERENCES:

1. Data Structures and Algorithms Using C++ by AnandaRaoAkepogu and RadhikaRajuPalagiri
2. Classic Data Structure by D. Samanta, Eastern Economy Edition.
3. Data Structures and Algorithms Made Easy by NarasimhaKarumanchi, Second Edition, Written in C/C++, CareerMonk Publications, Hyderabad
4. ADTs, Data Structures and Problem Solving with C++, Larry Nyhoff, Pearson
5. Data Structures using C++, D.S.Malik, 2nd Edition, Cengage Learning
6. Data Structures through C++, YashavantP.Kanetkar, BPB Publication
7. Data Structures using C and C++, YedidyahLangsam.MosheJ.Augenstein Aaron M.Tenenbaum, 2nd Edition,PHI
8. Data Structures using C & C++, Rajesh K.Shukla, Wiley-India
9. Tremblay J P and Sorenson P G, Introduction to Data Structures with Applications, 2nd Edition, McGraw-Hill, 1984.
10. Cormen T H, Leiserson C E, Stein C, and Rivest R L, Introduction to Algorithms, 2nd Edition, Prentice Hall of India, 2007.
11. Folk M J, Riccardi G, and Zoellick B, File Structures-An Object-Oriented Approach with C++, Pearson
12. T.H.Cormen, C.E.Leiserson, R.L.Rivest, C. Stein, Introduction to Algorithms, 2nd edition, Prentice-Hall India, 2001
13. J. Kleinberg and E. Tardos, Algorithm Design, Pearson International Edition, 2005.
14. Data Structures Using C and C++ YddishLangsam, Moshe J. Augenstein and Aaron M. Tanenbaum, Prentice Hall Of India (2nd Edition) (Chapters 1 to 8)

Course Outcomes:

After completion of the course the student will have:

1. A knowledge of various Methods and Notations for comparing the performance of various Data Structures.
2. A knowledge of development of linear data structures like stacks, Queues and their operations, Implementation using Arrays and Linked Lists.
3. A knowledge of propertiesof Binary Search Trees and balanced binary search trees.
4. A knowledge of properties of Splay Tress ,Red Black Trees ,AVL Tress and their implementation
5. A knowledge of efficient external searching techniques using Indexing, Hashing.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		1	2	1						
CO2	1	2	1		1	1						
CO3		1	2	2								
CO4		1	2	1	2							
CO5			2	2	1							

EET01 Basic Electrical Engineering

Instruction Hours / Week : 3 **Credits: 3**

Common to Civil, Mechanical, Chemical branches and with effect from 2016-17

Course Objectives:

This course is design to

1. Apprise student about fundamentals of Electrical Circuits and Machines
2. Make the student learn operation of electrical machines and computation of performance

Syllabus

UNIT-I

Basic Circuit Concepts: Basic circuit elements R, L and C—Classification of circuit elements, voltage and current sources—Kirchoff's laws—Star-delta and Delta to Star transformations, Network reduction techniques, Simple problems

UNIT-II

DC Circuits: DC Circuit analysis by mesh current method and Nodal voltage method, Superposition theorem, Thevenin's theorem and maximum power transfer theorem –Application to simple DC circuits

UNIT-III

AC Circuits: Average value—RMS value—form factor, crest factor---j-notation, Phasor diagrams, reactance, impedance and admittance, active power, reactive power, apparent power , power triangle.—Expression for real power in ac circuit—Analysis of simple---series and parallel circuits

UNIT-IV

DC Machines: Principle of operation of dc generator, emf equation, types of generators, principle of operation of dc motor, Back EMF, torque equation of dc motor, Illustrative examples, applications dc motors

UNIT-V

Transformers: Single phase transformer –principle of operation—types of transformers—emf equation, transformer on load

Induction Motors: principle of operation of 3-phase induction motor, types of 3-phase induction motorsPrinciple of single phase induction motor, types , applications of 3-phase and single phase induction motors

Illuminations: Introduction, Laws of Illumination, Lighting calculations, Design of lighting schemes

Text Books:

1. Network analysis by A Sudhakar, ShyamMohan (Tata McGrawHill)
2. Basic Electrical Engineering by DP Kothari, IH Nagrath (Tata McGrawHill)

References:

1. Electrical Technology – E. Hughes (University Press)
2. Electrical Circuits – Joseph Edminister (TMH Series)

Course Outcomes: Student will be able to

a. Understand and apply principles of basic electrical circuits
b. Analyse and apply theorems for different types of networks
c. Understand the principle of operation of DC machines, Transformers and Induction motors
d. Compute the performance of DC motor, Single phase Transformer
e. Carryout calculations related to design of illumination schemes

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3										
CO3	3	3	2									
CO4	3	3										
CO5	3	3	2				2					

ECT01 Basic Electronics Engineering

Instruction Hours / Week : 3 **Credits: 3**

Common to Civil, Mechanical, Chemical branches and with effect from 2016-17

Course Objectives:

1. This course is to focus on the basics of Electronics and Communication to other non-circuit branch students.
2. To understand Electronic devices used in day-to-day instrument.
3. To have knowledge of amplifier working principles.
4. To understand the digital circuits principles.
5. To have knowledge of instruments in measurements.
6. To gain knowledge of communication principles.

Syllabus

UNIT-I

Electronics Devices: Introduction to electronics, review of p-n junction operation, diode applications, Zener diode as regulator, Transister – Biasing, characteristics, FET-Operation, Types of FETs, Photo Electronic Devices.

UNIT-II

Amplifiers and applications: Transistor Amplifier, Amplifier characteristics, Simple RC coupled amplifier and frequency response. Cascaded amplifiers, FET Amplifier, Oscillator principle, LC and RC oscillators.

UNIT-III

Digital Circuits: Number systems, Conversion of number systems, Logic gates, Boolean theorems, Demorgan theorems, combination logic circuits, Flip-Flops, Counters and Shift Registers, Data converters, ADC and DAC convertors

UNIT-IV

Instrumentation: Measurements, Errors in measurements, Cathode Ray oscilloscope, Measurements using CRO – Voltage, Current, Frequency, Time and Phase angle, Transducers, Strain gauges, LVDT, Temperature measurements.

UNIT-V

Principles of Communication: Basic Communication system, Need for Modulation, Types of Modulation, AM Modulation and Demodulation, FM Modulation and Demodulation, Sampling Theorem, Pulse Modulation, Digital Modulation Techniques.

Text Books:

1. Salivahanan, N Suresh Kumar Electronic Devices and circuits, 3 rd Edition, McGraw Hill publications.
2. A. Ananda Kumar, Switching theory and logic design, Prentice Hall of India Ltd.
3. Helfrick and cooper, Modern Electronic Instrumention and Measurement techniques, Pearson Education.
4. Anokh Singh, Principles of Communication Engineering, S.Chand& Co. New Delhi
5. P. Ramakrishna, Analog Communication, Mcgraw Hill Co.

Course Outcomes:

1. Understands different types of Electronic Devices and working mechanism.
2. Have knowledge of amplifiers and oscillators used in day-to-day life.
3. Understands digital circuits used in computer systems and other systems.
4. Will have knowledge of measurements and measuring instruments.
5. Understands the principles of communication systems used in day-to-day life.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1		2							
CO2	2		2									
CO3		1		2	2							
CO4			2	1	2							
CO5			2	2	1							

CET 03 BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY

Instruction hours / week : 4 Hrs **Credits: 4**

Course Educational Objective (CEOs)

- To understand the suitability of masonry materials for construction.
- To learn the characteristics of different types of mortar tests
- To know about aggregates.
- To learn about high grade cements,
- To learn about Non-distractive testing methods.
- To understand different types construction practices
- To Learn Causes of damage and deterioration of concrete structures and their repairs
- To learn the application of civil engineering Construction equipment

UNIT-I

STONES-BRICKS

Stone as building material-criteria for selection-Tests on stones-Deterioration and preservation of stone work

Bricks-Classification-Manufacture of clay bricks-Tests on bricks-Compressive strength-Water absorption-Efflorescence-Bricks for special use-Refractory bricks

UNIT-II

CEMENT-AGGREGATES - CONCRETE

Cement ingredients-Manufacturing process-Types and grades-properties of cement -Hydration-Compressive strength-Tensile strength- Soundness and consistency-Setting time-Aggregates-Natural stone aggregates- Crushing strength-Impact strength-Flakiness-Abrasion Resistance-Grading-Sand-Bulking.

Concrete- Manufacture-Batching plants-RMC-Properties of fresh concrete-Slump-Flow and compaction-Principles of Hardened concrete-Compressive, Tensile and shear strength-Modulus of Rupture-Tests

UNIT-III

TIMBER AND OTHER MATERIALS

Timber- Market forms-Industrial timber-Plywood-Veneer- Thermocole-Panels of laminates-Steel -Aluminium and other metallic materials-composition-Uses-Market forms-Mechanical treatment-Paints-Varnishes-Distempers- Bitumens

UNIT-IV

CONSTRUCTION PRACTICES

Types of foundations-Stone Masonry-Brick Masonry- Composite Masonry-Cavity walls-Flooring-Formwork-Centering and shuttering sheet piles-Slip and Moving forms-Roofs and roof covering- Joints in Concrete-Plastering and Pointing-Shoring-Scaffolding-Under pinning-Submerged structures.

UNIT-V

CONSTRUCTION EQUIPMENT

Selection of equipment for earth work, concreting, material handling and erection of structures-Dewatering and pumping equipments

TEXTS BOOKS

1. R.K. Rajput, Engineering Materials, S.Chand and company Ltd., 2000.
2. M.S.Shetty, Concrete Technology (Theory and Practice), S.Chand and company Ltd., 2003
3. Gambir, M.L, Concrete Technology, Tata Mcgraw hill Publishing Company,1995.
4. Shetty, M.S., Concrete Technology, Theory and Practice, S.Chand and Company, 2003.

REFERENCE BOOKS

1. Arora, S.P. and Bindra, S.P., Building Construction, DhanpatRai and Sons, 1997.
2. Punmia, B.C., Building Construction, Lakshmi Publications (P) Ltd., 1993.
3. Peurifoy, R.L., Formwork for Concrete Structures, Mcgraw hill book Co., 1999.

Course Outcomes (COs)

After completion of the course the student will have:

- To find the suitability various building materials at a particular location in the building construction.
- To know the preparation of concrete and tests to be performed
- Ability to utilize various modern building materials like timber products, protective coatings, and fibre textiles
- Able to know the different types of concretes their application, mix design and tests.
- To develop acquaintance over service requirements like protectives, damp and termite proofing.
- Able to repair and rehabilitation of distressed structures and use of construction equipment in the field.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		1	1		1	2	1	2	1	1	1
CO2	1		1	1		1	2		2	1	1	1
CO3	2	1	1	1		1	2	1	2	1	2	1
CO4	2	2	2	1		1	2	2	2	1	2	1
CO5	1	1	1	1	2	2	1			1	2	1
CO6	2	1	1	1	2	1	1	1		1	2	1

ENT01 English

Instruction Hours / Week : 3 **Credits: 3**

Common to all branches and with effect from 2016-17

Course Objectives:

1. To introduce students elements of grammar and composition of English language.
2. To familiarize students with literary texts such as short stories and prose passages.
3. To maintain linguistic competence through training in vocabulary, sentence structures and pronunciation.
4. To develop communication skills by cultivating the habit of reading comprehension passages.
5. To train the students to develop the language skills like listening, speaking, reading and writing.
6. To initiate them into use of self-instructed learner friendly modes of language learing through competence.

Syllabus

Unit-I Effective Communication: Role and Importance of Communication, Features of Human Communication, Process of Communication, Interpersonal Communication, Barriers, Types- Verbal, Non-Verbal.

Unit-II Grammar: Articles, prepositions, tenses, reported speech, idioms and phrases

Unit-III Listening Skills: Process of Listening, Tips for Effective Listening,
Speaking Skills: Basics of Spoken English, English Sounds, Rhythm and Intonation
Telephonic Skills, Group Communication
Reading Skills: Developing Reading Skills, Reading Strategies, Reading Comprehension,
Writing Skills: Paragraph Writing, Essay Writing, E-writing, Job applications, , Reports. Resume and Letter Writing.

Unit-IV
Soft Skills: Tem Work Skills, Interview Skills, Problem- Solving Skills Adoptability Skills, Presentation Skills and Group Discussions.

Unit- V Stories from Delight and Wisdom (An Anthology of Short Stories)

1. The Gift of Magi By O. Henry
2. The Diamond Necklace by Guy De Maupassant
3. My Brother, My Brother by Norah Burke
4. The Open Window by Saki
5. The Child by Premchand

Text Books:

1. Oxford guide to Effective writing and Speaking by John Seely, Oxford University Press, 2013, ISBN- 978-0-19-871393-7
2. Delight and Wisdom published by Orient Blackswan, 2009, ISBN: 978-81-250-3716-3

Reference Books:

1. David Green, Structure and Composition in English, Macmillan Publishers India Limted.
2. Communicative English by E. Suresh Kumar, P. Sreehari, Orient BalckSwan, 2009. ISBN: 13:9788125032502
3. English and Soft Skills by S P DhanavelpublishedbyOrientBlackswan, 2013. ISBN 9788125039808
4. Personality Development and Soft Skills by Barun K. MitrapublishedbyOxford University Press. 2012. ISBN : 13:97280198066217

Course Outcomes:

1. Student will be able to get a thorough knowledge of various topics of grammar of English language.
2. Student will be trained in close reading of language and its relation to literary form.
3. Student will be able to read English correctly with focus on fluency and pronunciation.
4. Student will be able to understand the use of English through computer software.
5. Student will be in a position to face computer based competition exams like TOEFL.
6. They will get an ability to communicate effectively and to write accurately using English language.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2									
CO2	2		2	2								
CO3		1		2	2							
CO4			2	2	3							
CO5		1	1	2								
CO6												

CSP02 Data Structures Lab

Instruction Hours / Week : 3 **Credits: 2**

Common to all branches and with effect from 2016-17

Course Objectives:

1. Arm the students with the basic programming concepts.
2. Arm the students with the necessary constructs of C++ programming.
3. Choose the appropriate data structure and algorithm design method for a specified application.
4. To Gain knowledge in practical applications of data structures.

Syllabus

1. Write a C++ Program to create a sequential file with at least 5 records, each record having thestructure shown below:

USN	Name	Marks1	Marks2	Marks3
Non-zero positive integer	25 Characters	Positive Integer	Positive Integer	Positive Integer

Write necessary functions

a. To display all the records in the file.

b. To search for a specific record based on the USN. In case the record is not found, suitable message should be displayed. Both the options in this case must be demonstrated.

2. Write and demonstrate the following C++ functions:
   a. **newStrCpy**that does the same job as **strcpy**
   b. **newStrCat** that does the same job as **strcat** without using any library functions.
3. Write a C++ Program, which accepts the Internet Protocol (IP) address in decimal dot format(ex. 153.18.8.105) and converts it into 32-bit long integer (ex. 2568095849) using **strtok** library function and unions.
4. Write a C++ Program to construct a **stack of integers** and to perform the following operations on it:
   a. Push
   b. Pop
   c. Display

   The program should print appropriate messages for stack overflow, stack underflow, and stack empty.
5. Write a C++ Program to convert and print a given valid parenthesized **infix** arithmetic expression to **postfix** expression. The expression consists of single character operands and the binary operators+ (plus), - (minus), * (multiply) and / (divide).

6. Write a C++ Program to evaluate a valid **suffix/postfix** expression using stack. Assume that thesuffix/postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).
7. Write a C++ Program to simulate the working of a **queue of integers** using an array. Provide the
   following operations:
   a. Insert
   b. Delete
   c. Display
8. Write a C++ Program to simulate the working of a **circular queue of integers** using an array. Providethe following operations:
   a. Insert
   b. Delete
   c. Display

9. Write a C++ Program using dynamic variables and pointers, to construct a **singly linked list** consisting of the following information in each node: student id (integer), student name (character string) and semester (integer). The operations to be supported are:
   a. The insertion operation
      i. At the front of a list
      ii. At the back of the list
      iii. At any position in the list
   b. Deleting a node based on student id. If the specified node is not present in the list an error Message should be displayed. Both the options should be demonstrated.
   c. Searching a node based on student id and updates the information content. If the specified Node is not present in the list an error message should be displayed. Both situations shouldbe displayed.
   d. Displaying all the nodes in the list.
   (Note: Only one set of operations among a, b and c with d may be asked in the examination)
10. Write a C++ Program using dynamic variables and pointers to construct a **stack of integers**using**singly linked list** and to perform the following operations:
    a. Push
    b. Pop
    c. Display
    The program should print appropriate messages for stack overflow and stack empty.
11. Write a C++ Program using dynamic variables and pointers to construct a **queue of integers** using **singly linked list** and to perform the following operations:
    a. Insert
    b. Delete
    c. Display
    The program should print appropriate messages for queue full and queue empty.
12. Write a C++ Program to support the following operations on a **doubly linked list** where each node consists of integers:
    a. Create a doubly linked list by adding each node at the front.

b. Insert a new node to the left of the node whose key value is read as an input
c. Delete the node of a given data, if it is found, otherwise display appropriate message.
d. Display the contents of the list.
(Note: Only either (a, b and d) or (a, c and d) may be asked in the examination)

13. Write a C++ Program
    a. To construct a **binary search tree** of integers.
    b. To traverse the tree using all the methods i.e., **inorder, preorder and postorder**.
    c. To display the elements in the tree.
14. Write recursive C++ Programs for
    a. Searching an element on a given list of integers using the **Binary Search method.**
    b. Solving the **Towers of Hanoi problem**.

Text Books:

1. Data structures and Algorithms using C++, AnandaRaoAkepogu and RadhikaRajuPalagiri, Pearson Education.
2. C++ Solutions for Mathematical Problems, Ghosh, Arun, New Age International Publishers.
3. Data Structures A Pseudocode Approach with C++, IndiaEdition, R.F.GilbergandB.A.Forouzan,Cengage Learning.
4. Programming Principles and Practice using C++,B.Stroustrup,Addison-Wesley(Pearson education).
5. Data Structures and STL, W.J.Collins,McGrawHill,International edition.
6. Data structures and Algorithms with OODesign patterns inC++,B.R.Priess,John Wiley& sons.
7. The Art,Philosophy, and Science of OOP with C++,RickMiller,SPD.
8. C++ for Programmers,P.J.Deitel and H.M.Deitel,PHI/Pearson

Course Outcomes:

1. Understand algorithmic thinking and apply it to programming.
2. Be able to design and analyze the time and space efficiency of the data structure.
3. Be capable to identity the appropriate data structure for given problem.
4. Have practical knowledge on the application of data structures.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		1	2	1						
CO2	1	2	1		1	1						
CO3		1	2	2								
CO4		1	2	1	2							

ENP01 English Communication Lab

Instruction Hours / Week : 3 **Credits: 2**

Common to all branches and with effect from 2016-17

Course Objectives:

1. To enable students to use language software.
2. To make them aware of western accents.

Syllabus

At least twenty exercises covering the topics: Stress, Introduction, Accent, Intonation, English vsHinglish and Important Skills using Computer-Aided Packages.

Text Book:

1. Barry Tomalin and Suhashini Thomas, International English for Call Centres, McMillan Publishers, India Limited, 2009.

Course Outcomes:

1. Students gain felicity in using language software.
2. They are exposed to different accents of the language.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2									
CO2	2		2	2								

III SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
MAT 03	Engineering Mathematics III	3	2		5	Basic	4
MET02	Basic Mechanical Engineering	3	-		3	Basic	3
CET 04	Engineering Mechanics	3	2		5	Core	4
CET 05	Engineering Geology	3	-		3	Core	3
CET 06	Fluid Mechanics and Hydraulic Machines	3	2		5	Core	4
CET 07	Surveying	3	2		5	Core	4
CEP 01	Surveying Laboratory			3	3	Practical	2
CEP 02	Engineering Geology Laboratory			2	2	Practical	1
		18	8	5	31		25

MAT 03 ENGINEERING MATHEMATICS – III

Instruction Hours / Week: 5 **Credits: 4**

Course Objectives:

1. Extending their skills in elementary calculus to the complex plane.
2. Finding Taylor's and Laurent series for complex functions.
3. Applying complex residue theory to integration of real valued functions over the real line.

UNIT I

Special Functions –

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UNIT II

Complex analysis - I: Analytical functions - Cauchy-Reimann equations – Complex integration - Cauchy's theorem - Integral formula - Evaluation of integrals

UNIT III

Complex analysis - II**:** Taylor's and Laurents' series- Transformations- Conformal mapping - Bilinear transformations - Transformation of 1/z, z^2, sin z and cos z.

Complex anaylasis –III: Singularities - Poles - Residues - Residue theorem – Contour integration- Evaluation of real integrals

UNIT IV

Partial differential equations - I : Formation of differential equations - Classification - First order linear partial differential equations – Legranges' linear equation - Method of multipliers - first order non-linear partial differential equations - Charpits method.

UNIT V

Partial differential equations - II: Method of separation of variables - One dimensional wave equation - Heat equation – Laplace's equation.

Text Books:

1. Grewal B S, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. Venkataraman M K, Engineering Mathematics, Vol. I & II, National Publishing Company, 1993.
3. Venkataraman M K, Engineering Mathematics, National Publishing Company, 1995.
4. Grewal B S, Engineering Mathematics, 13th Edition, Khanna Publications.
5. Kreyszig E, Advanced Engineering Mathematics, 8th edition, Wiley, 1998.

Course Outcomes:

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

CO1: Differentiate and integrate functions of a complex variable, including the evaluation of contour integrals using the Residue Theorem and the evaluation of some real integrals using contour integration.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		1	1					1	1	

MET02 BASIC MECHANICAL ENGINEERING

Instruction Hours / Week: 3 **Credits: 3**

Common to EEE, ECE, CSE branches and with effect from 2016-17

COURSE OBJECTIVES:

1. To give overall picture of mechanical engineering from the point of view of basic concepts.
2. To learn about basic laws of thermodynamics.
3. To give insight into IC engines, steam engines, and steam turbines, gas turbines.
4. To make known the basic manufacturing processes and machine tools.
5. To learn about power transmission devices.

UNIT – I

Introduction to Thermodynamics – Concept of a system – Types of Systems, Thermodynamic Equilibrium – Properties, State, Process and Cycle, Zeroth Law, Energy Interactions – Heat and work, Types of work.

First and Second Laws of Thermodynamics: First law, Cycle and process, Specific heats, Heat interactions in a closed system for various processes, Limitations of First law, Concept of Heat Engine (H.E.) and reversed heat engine (Heat pump and refrigerator), Efficiency/COP, Second Law: Kelvin – Plank and Clausius Statements, Carnot Cycle, Carnot Efficiency, Property of Entropy – T- S and P – V diagrams

UNIT – II

Thermal Power Plant: Thermal power plant layout – Four circuits – Rankine cycle, Boilers: Fire tube Vs Water Tube; BobCock and Wilcox, Cochran Boilers, Steam Turbines, Impulse Vs. Reaction Turbines, Compounding of Turbines.

UNIT – III

Internal Combustion Engines (IC): I.C. 2 – Stroke and 4 – Stroke engines – S.I. engines and C.I. engines – Differences Heat transfer – Modes – Thermal resistance concept, Conduction, Composite walls and Cylinders. Combined Conduction and Convection – Overall Heat transfer Coefficient, Simple Numerical Problems in Heat transfer

UNIT – IV

Manufacturing Processes : Engineering Materials ; Classification, Properties of materials, Metal Casting, Moulding, Patterns, Hot working and Cold working , Extrusion, Forging, Rolling and Drawing.

Machine Tools and Machining Processes – Lathe Machines and Lathe operations, Milling machines, Types – Milling operations , Shaper, Planer, Drilling and Grinding machines.
Welding – Gas welding, Arc Welding, Soldering and Brazing

UNIT – V

Power Transmission – Transmission of Mechanical Power, Belt drives, Simple Numerical Problems, Gear Drives – Simple Numerical Problems

Basics of Automotive vehicle – Brakes – Types - Clutch and Differential

TEXT BOOKS:

1. Mathur, M.L., Mehta F.S. and Tiwari R.P., Elements of Mechanical Engineering, Jain Brothers, New Delhi, 2011.
2. Roy K.P. and HazraChowdary, S.K., Elements of Mechanical Engineering, Media Promoters and Publishers Pvt., Ltd, 2002.
3. Rudramoorthy R., Thermal Engineering, Tata McGrawHill Book Company, New Delhi, 2003.
4. HazraChowdary, S.K., and Bose, Workshop Technology ,Vol. I and II, Media Promoters and Publishers Pvt. Ltd., 2002.

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

1. Understand basics of thermodynamics and components of thermal plant
2. Identify engineering materials and their properties, manufacturing methods encountered in engineering practice.
3. Understand basics of heat transfer, refrigeration and internal combustion engines.
4. Understand mechanism of power transfer through belt, chain, rope and gear drives.
5. Understand functions and operations of machine tools including milling, grinding, and shaping machines.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3		2		1		2	1	
CO2	3	3			2			3		2		3
CO3	3	3		2	2	1			1		3	
CO4	3	3		3		2		2		3		
CO5	3	2			3		3		3		1	

CET 04 ENGINEERING MECHANICS

Instruction Hours / week : 5Hrs **Credits: 4**

Course Educational Objective (CEOs)

1. To understand basics of forces
2. To understand forces on rigid bodies
3. To learn internal stress system due to action of external forces.
4. To study various aspects of CG
5. To study and apply concepts of M.I

UNIT – I

STATICS : Basic concepts – System of force, Concurrent and non-concurrent coplanar and non-coplanar forces – Resultant – Moment of force and its application – Couples and resultant of force systems – Equilibrium of systems of forces – Free body diagrams, Equations of equilibrium of coplanar systems and spatial systems.

UNIT – II

Analysis of plane trusses: Types of supports-Types of trusses-Analysis of determinate trusses using method of joints and method of sections.

UNIT – III

CENTRE OF GRAVITY AND MOMENTS OF INERTIA: Theory of Pappus – Centroids of composite figures – Areas of gravity of bodies – Moment of inertia – Parallel and perpendicular axis theorems – Moments of inertia of composite areas (rolled and built up sections) – Radius of gyration of areas.-Polar Moment of Inertia.

UNIT – IV

SIMPLE STRESES AND STRAINS: 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 moduli and relationship between elastic constants – Bars of varying section – Composite bars – Temperature stresses.

UNIT – V

STRAIN ENERGY: Gradual, sudden and impact loading – Endurance limit- principles of virtual work and its applications.

TEXT BOOKS:

1. Ghose D.N. – Applied Mechanics and Strength of Materials.
2. Timoshenko & Young – Engineering Mechanics.
3. Junarkar SB – Mechanics of Structures – Vol. I.
4. Junarkar SB – Elements of Applied Mechanics.

Course Outcomes (COs)

After completion of the course the student will have:

- To acquire the basic knowledge of the analysis of general structures when external load are applied.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		2			2		1		1	

CET 05 ENGINEERING GEOLOGY

Instruction Hours / week : 3 HrsCredits: 3

Course Educational Objective (CEOs)

1. To learn various geological parameters.
2. Identification of minerals
3. Identification of rocks.
4. Identification of geologic structures

UNIT – I

Introduction to geology and its various branches -Role of Earth Sciences in Civil Engineering Operations Processes acting at the surface of the earth - Volcanism, Geological action of wind, glaciers, rivers and oceans - Rock weathering.

UNIT - II

Study of various properties for the identification of minerals - Study of minerals like Quartz and its varieties. Feldspars, Garnet, Mica, Olivine, Hornblende, Augite, Calcite, Talc, Kyanite, Bauxite and Clay minerals.

UNIT – III

Origin and formation of rocks - Classification of rocks - Igneous, Sedimentary and Metamorphic rocks - Their textures and structures -Study of rocks like Granite, Gabbro, Dolerite, Basalt, Breccia, Conglomorate, Sand stone, Shale, Limestone, Laterite, Quartzite, Schist, Gneiss, Marble, Slate.

UNIT – IV

Elements of structural geology like strike, dip, outcrop. Study of folds, joints, faults and their importance in civil engineering works

UNIT – V

Geology of dams, reservoirs, tunnels landslides and rock falls. Earthquakes. Groundwater exploration. Rock as construction materials

TEXT BOOKS:

1. A text book of geology By Mukharjee.P.K.
1. Principles of Engineering geology and Geotechnics By Krynine& Judd
2. Geology for Engineers by Blyth & de freitaus
3. Fundamental of Engineering Geology by F.H.Bell.
4. A Text Book of Engineering Geology - N.Chennakesavulu.
5. Engineering and general Geology by Parbin Singh
6. Engineering Geology by R.E.Goodman

Course Outcomes (COs)

After completion of the course the student will have:

1. To apply the geological knowledge to Civil Engineering Constructions, at different stages. The kind of study exposes the geological draw backs, if any.
2. To help the site engineers to take suitable precautionary measures to overcome the drawbacks but also to take advantage of the site geology findings wherever possible.
3. To take precautionary measures in civil engineering constructions based on geological parameters.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1		1			1		2
CO2	1	2	1	2	1		1			1		2
CO3	1				1		1		1		2	1

CET 06 FLUID MECHANICS AND HYDRAULIC MACHINES

Instruction Hours / week : 5 HrsCredits: 4

Course Educational Objective (CEOs)

1. To learn fluid properties
2. To understand fluid flow concepts
3. To derive fundamental equations of fluid flow
4. To know about pressure and velocity
5. To know discharge measuring devices
6. To learn laminar and turbulent characteristics of pipe flows
7. To understand boundary layer concept, its separation and control
8. To determine drag and lift forces on submerged bodies
9. To study the characteristics of pumps and turbines

UNIT – I

FLUID PROPERTIESAND STATICS : Definition of a fluid –Density, Specific weight, Specific volume, Specific gravity – Viscosity – Bulk modulus of elasticity – Vapour pressure – Surface tension and capillarity- Pressure at a point – Absolute and gauge pressure – Pascal's law – Pressure measurement – Manometers – Hydrostatic thrust on plane and curved surfaces.

FLUID FLOW CONCEPTS: Flow characteristics – Velocity – Acceleration – Types of flow – Streamlines, path lines, streak lines – Stream function, velocity potential, flownet – Circulation and Vorticity.

UNIT – II

FUNDAMENTAL EQUATIONS: Continuity equation – Euler's equation of motion along a streamline – Bernoulli's equation – Applications of Bernoulli's Equation – Free jets and vortex flows - Linear momentum equation –Free liquid jets - Fixed and moving vanes – Moment of momentum equation – Torque on Sprinklers.

DIMENSIONAL ANALYSIS AND SIMULITUDE: Dimensional homogeneity – Dimensions and units - Buckingham's π theorem – Dimensionless parameters – similitude-Model studies.

UNIT – III

LAMINAR AND TURBULENT FLOWS : Relation between Shear and Pressure Gradients in Laminar Flow –Velocity and Shear distribution in Circular Pipes – Hagen – Poiseuille Law –Hydrodynamically Smooth and Rough Boundaries – Velocity Distribution for Turbulent Flow in Pipes –Resistance to Flow of Fluid in Smooth and Rough Pipes.

FLOW THROUGH PIPES: Laws of Fluid Friction – Darcy – Weisbach Equation and Other Formulae for Head Loss due to Friction in Pipes – Minor Losses in Pipes – Pipes in Series and Parallel – Siphon.

UNIT – IV

FLOW MEASUREMENT: Velocity measurement – Pitot tube – Pitot static tube – Discharge measurement – Orifices and Mouth pieces – Venturimeter, Nozzlemeter, Orificemeter, Notches and Weirs.

BOUNDARY LAYER THEORY AND FLUID FLOW AROUND SUBMERGED OBJECTS: Thickness of Boundary Layer – Boundary Layer Along a Long Thin flat Plate and its Characteristics –Laminar Boundary Layer – Turbulent Boundary Layer – Laminar Sublayer –Separation of Boundary Layer – Methods of Controlling the Boundary Layer - Types of Drag –Drag on a Sphere – Drag on a Cylinder –Drag on an Airfoil – Development of Lift on Immersed Bodies.

UNIT – V

HYDRAULIC TURBINES: Heads, Efficiencies and work done – Pelton Wheel, Francis Turbine and Kaplan Turbine – Draft Tube theory - Governing – Surge Tanks – Unit Quantities – Specific Speed – Performance Characteristic Curves –Cavitation.

CENTRIFUGAL PUMPS : Components – Working – Types – Work done – Heads – Losses and Efficiencies – Specific Speed –Multi Stage Pumps – Performance Characteristic Curves – Net positive Suction Head (NPSH) – Cavitation.

TEXT BOOKS

1. Hydraulics and Fluid Mechanics including Hydraulic Machines by P.N. Modi and S.M. Seth – Twentieth edition 2015, Standard Book House , New Delhi.
2. Fluid Mechanics and Hydraulic Machines by R.K.Rajput - 2002 Publication, S.Chand& Company Ltd., New Delhi.
3. Fluid Mechanics and Hydraulic Machines by R.K.Bansal -Revised Ninth edition 2010, Laxmi Publications (P) Ltd., New Delhi.

REFERENCE BOOKS

1. Fluid Mechanics by Victor L. Streeter and E.Benjamin Wylie, Keith W. Bedford – Edition 2010, Tata Mc Graw Hill Education Private Limited, New Delhi.
2. Fluid Mechanics and Turbo machines by Madan Mohan Das. – First Edition 2009, PHI Learning Pvt.Ltd., New Delhi.

Course Outcomes (COs)

After completion of the course the student will have:

1. To solve fluid flow problems using fundamental principles
2. To measure pressure, velocity and discharge
3. To perform model analysis
4. To analyze and solve pipe flow problems
5. To design submerged bodies based on drag and lift characteristics
6. To select suitable pumps and turbines based on the requirements

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	2					2	1	2
CO2	2	2	2	2	2		1			2	2	2
CO3	2	1	2	2	2					2	1	2
CO4	2	2	2	2	2		1			2	2	2
CO5	2	2	2	2	2		1			2	2	2
CO6	2	2	2	2	2		1			2	2	2

CET 07 SURVEYING

Instruction Hours / week :5Hrs Credits: 4

Course Educational Objective (CEOs)

1. To study basics of surveying
2. To study basics of leveling,
3. To study basics of theodolite surveying
4. To apply the concepts of surveying and leveling to field problems
5. To obtain knowledge about tacheometric surveying
6. To handle modern surveying instruments.

UNIT – I

Introduction

Overview of plane surveying-Chain, Compass and plane table – Objectives – Principles-Classification

Distance and Direction Measurement:

Distance measurement – use of chain/ Tape – EDM- Meridians and Bearings, Principle, working and use of Prismatic compass and Surveyor's compass, WCB and Reduced bearing, Dip and declination, Computation of bearings of closed traverse given the bearing of one of the lines, Computation of included angles given the bearings of lines of a closed traverse, Local attraction- determination and corrections

UNIT – II

LEVELLING AND CONTOURING:

Principles and basic definitions, Fundamental axes and part of dumpy level, types of adjustments and objectives, Temporary adjustments of a dumpy level, Type of leveling – Simple leveling, Reciprocal leveling, profile leveling, cross sectioning – Fly leveling, Booking of levels – Rise and fall method and height of instrument method – Comparison Arithmetic checks, Errors and precautions. Contours and their characteristics, Methods of contouring – Direct and Indirect methods – Uses of contours

UNIT – III

COMPUTATION OF AREAS AND VOLUMES:

Areas from field notes - computation of areas along irregular boundaries and area consisting of regular boundaries – Embankments and cutting for a level and two level sections with and without transverse slopes. Determination of capacity of reservoirs, volume of borrow pits

UNIT – IV

THEODOLITE:

Theodolite – Description- uses and adjustments - Measurement of horizontal and vertical analysis – Principles of Electronic Theodolite – Traversing.

UNIT – V

TACHEOMETRY: Stadia and tangential methods of tachometric surveying. Distance and elevation formulae for staff vertical position

CURVES: Types of curves-setting out-simple & compound curves.

MODERN SURVEYING INSTRUMENTS:

Total Station -Introduction, Functions, Parts of Total station instrument; Handling and setting up a Total Station Instrument. Measuring horizontal angles, Deflection angles, Azimuths, Vertical or Zenith angles
Global Positioning System (GPS) - Principle and working of GPS.

TEXT BOOKS:

1. Surveying and Levelling Prof. C.Venkatramaiah
2. Surveying and levelling by R.Subramanian
3. Plane Surveying by A.M. Chandra.
4. Elements of Geomatics by P.R. Wolf.
5. Higher Surveying by A.M. Chandra.

Course Outcomes (COs)

After completion of the course the student will have:

- Measure and layout elevations and relative position of points, understand plans and field notes.
- Perform computations using information gathered from differential levelling, traversing, area calculations, and volume/ earthwork.
- Ability to design and set out curves
- Ability to use modern surveying equipment

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1		1					1	
CO2	2	1	2	1		1		1			1	
CO3	2	1	2	1		1					1	
CO4	2	2	1	1		2		1			1	

CEP 01 SURVEYING LABORATORY

Practicals / week: 3 Hrs **Credits : 2**

Course Educational Objective (CEOs)

- To apply the possess knowledge about survey field techniques
- To apply the possess knowledge about chain survey
- To determine distances, areas of polygons
- To gain knowledge of modern field measurement tools and techniques

EXERCISE – 1

- Study of various surveying equipments – chain, Tape, compass, Surveyor's compass, Plane table, Levelling instrument; Theodolite.
- Measurement of distance by chain, Tape

EXERCISE – 2

a. Area of a polygon by cross staff survey
b. Study of Prismatic Compass and determination of distance between two inaccessible points by the compass.

EXERCISE – 3

a. Compass traversing and adjustment of closing error by Bowditch method (Graphical method)

EXERCISE – 4

Reduction of Levels by (1) Collimation method (2) Rise & Fall method

EXERCISE – 5

Block Contouring

EXERCISE – 6

Study of vernier transit Theodolite and Measurement of horizontal angles by Repetition method and Reiteration method.

EXERCISE – 7

a. Measurement of vertical angles – Determination of heights of objects
b. To determine the distance and difference in elevation between two inaccessible points using theodolite.

EXERCISE – 8

a. To determine the tachometric constants and to determine the distance between two points using stadia tacheometry
b. To determine the distance between two points using tangential tacheometry

EXERCISE – 9

a. To set out simple curve using linear methods – Perpendicular offsets from long chord
b. To set out simple curve using Rankine's deflection angles method

EXERCISE – 10

a) Demonstration of Total Station Instrument. To determine height of remote object, horizontal distance and co-ordinates of points using Total Station Instrument.

b) Demonstration of GPS Receiver. Overview of GPS.

Course Outcomes (Cos)

After completion of the course the student will have:

1. Ability to use the techniques, skill and surveying equipment for engineering practice.
2. Applying mathematics concepts in the field of surveying.
3. Develop an understanding of modern surveying equipment

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1		1		1	1	2	
CO2	1	2	2	2	1		1		1		2	
CO3	1	2	2	2	1		1		2	2	2	

CEP 02 ENGINEERING GEOLOGY LABORATORY

Practicals / week: 2 Hrs **Credits: 1**

Course Educational Objective (CEOs)

1. To enable the student to learn various geological structures
2. To find the properties of minerals,
3. Identification of rocks
4. Field applications
5. To study geological maps

1. Description of the geological models.
2. Study of the Physical properties of Minerals.
3. Study and Identification of the Rocks.
4. Structural Geology Problems
   a) Thickness Problems.
   b) Strike and Dip Problems
   c) Bore Hole or Three point problems.
5. Study of the Geological Maps.
6. Description of the geological modals.
7. Study of the Physical properties of Minerals.
8. Study and Identification of the Rocks.
9. Structural Geology Problems
   a) Thickness Problems.
   b) Strike and Dip Problems
   c) Bore Hole or Three point problems.

Course Outcomes (COs)

After completion of the course the student will :

1. Study and identify of minerals, rocks and structures with their utilization in civil engineering works.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	1			1	2	1	

IV SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
CET 08	Mechanics of Solids	3	2		5	Core	4
CET 09	Applied Hydraulics	3	2		5	Core	4
CET 10	Soil Mechanics	3	2		5	Core	4
CET 11	Structural Analysis-I	3	2		5	Core	4
CET 12	Environmental Engineering –I	4	-		4	Core	4
CET 13	Building Planning, Design and Drawing	2	2		4	Core	3
CEP 01	Fluid Mechanics & Hydraulics Machinery Laboratory			3	3	Practical	2
CEP 02	Material Testing Laboratory			2	2	Practical	1
		18	8	5	33		26

IV Semester – Syllabus

CET 08 MECHANICS OF SOLIDS

Instruction Hours / week : 5 HrsCredits: 4

Course Educational Objective (CEOs)

To acquire the knowledge about behavior of members subjected to various types of forces on the members.

UNIT I

SHEAR FORCE AND BENDING MOMENT:

Definition of beam - Types of beams - Concept of shear force and bending moment - S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads - Point of contraflexure - Relation between S.F, B.M and rate of loading at a section of a beam.

UNIT II

FLEXURAL STRESSES AND SHEAR STRESSES:

Theory of simple bending - Distribution of flexural stresses and shear stresses - Resilience due to flexure and shear

UNIT III

DIRECT AND BENDING STRESSES:

Stresses under the combined action of direct loading and B.M - Core of a section - Circular, rectangular and triangular (solid and hollow) - Determination of stresses in the case of chimneys, retaining walls and dams.

COLUMNS:

Stability of columns - Euler's theory - Various end conditions - Rankine's theory - Eccentrically loaded columns (without initial curvature).

UNIT IV

TORSION OF CIRCULAR SHAFTS:

Theory of pure torsion in solid and hollow circular shafts - Transmission of power - Combined bending, torsion and end thrust.

SPRINGS:

Types of springs - Close and open coiled helical springs under axial loads and axial couple - springs in series and parallel - Carriage or leaf springs.

UNIT V

PRINCIPAL STRESSES:

Principal stresses and principal strains - Mohr’s circle of stresses – Theories of failure.

CYLINDERS:

Thin cylinders subjected to internal fluid pressure - Thick cylinders under internal and external pressure - Compound cylinders.

TEXT BOOKS:

1) Mechanics of Structures Vol.I&Vol.II by S.B.Junnarkar.
2) Analysis of Structures by Vazirani&Ratwani.
3) Strength of Materials Vol.I&Vol.II by Timoshenko.
4) Strength of Materials by Andrew Pytal and Ferdinand L.Singer (Longman).

REFERENCES:

1) Engineering Mechanics by Egor. P. Popov.

Course Outcomes (COs)

After completion of the course the student will have:

1) Ability to analyze the stress state of members in tension, Shear torsion and bending.
2). Ability to construct the SFD, BMD, TMD Diagrams and to drain their stress diagrams.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2		1				2	2	2	1
CO2	2	1	2	1	1				2	2	2	1

CET09 APPLIED HYDRAULICS

Instruction Hours / week : 5Hrs **Credits: 4**

Course Educational Objective (CEOs)

1. To understand the basic concepts of channel flows
2. To learn specific energy and specific force concepts
3. To analyze and compute uniform and gradually varied flows
4. To learn the design aspects of erodible and non-erodible channels

UNIT - I

INTRODUCTION TO CHANNEL FLOW:

Differences between pipe flow and channel flow -classification of flows - Geometric elements of channel section - velocity and pressure distributions - Velocity distribution coefficients - Parallel and curvilinear flows - Pressure correction coefficient.

UNIFORM FLOW:

Uniform flow - Chezy and Manning fomulae - Hydraulically efficient channel sections (Rectangular, triangular, trapezoidal and circular sections) - Uniform flow computations

UNIT - II

SPECIFIC ENERGY AND CRITICAL DEPTH:

Specific energy and critical depth - Critical flow computations - Applications – Transitions - channels with a hump-Transition with change in width – Mitra and Hinds methods of design of transitions.

UNIT - III

GRADUALLY VARIED FLOW:

Differential equation of gradually varied flow - classification of flow profiles - Features of flow profiles - Control sections - Analysis of flow profiles - Gradually varied flow computations - Direct step method – standard step method.

UNIT - IV

RAPIDLY VARIED FLOW:

Hydraulic jump - Momentum equation –Hydraulic jump in rectangular channels -classification of jumps - Characteristics of jump in a horizontal rectangular channel - Rapidly varied unsteady flow - Surges in rectangular channels – positive and negative surges.

UNIT - V

DESIGN OF CANALS:

Design of non-erodible channels- methods of economic section and permissible velocity- design of erodible channels-Regime approach-Kennedy's silt theory and Lacey's regime theory

TEXT BOOKS:

- Open Channel Hydraulics by VenTe Chow, McGraw-Hill International Book Company, New Delhi.
- Flow in Open Channels by Subramanya, K. - Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
- Flow through Open Channels by K.G.Rangaraju - Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.

- Open channel flow by Madan Mohan Das – PHI Learning Pvt.Ltd., New Delhi.

Course Outcomes (COs)

After completion of the course the student will have:

- To design channel transitions and hydraulics jump stilling basins
- To study the effects of hydraulic structures on flow
- To design irrigation canals, storm water drains, sewers etc.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1			1		1	1	1
CO2	2	2	2	1	1			1		1	1	1
CO3	2	2	2	1	1			1		1	1	1

CET 10 SOIL MECHANICS

Instruction Hours / week : 5 Hrs Credits: 4

Course Educational Objective (CEOs)

The course should enable the students to:

1. Develop an understanding of the index properties of soils and the various methods of soil classification.
2. Be acquainted with different modes of soil-water, permeability, effective stress concepts and seepage through porous media and flow nets.
3. Gain knowledge about the different tests carried to find out the shear strength of soil.4.

UNIT – I

PHYSICAL PROPERTIES OF SOILS:

Soil as a 3-phase system -Fundamental relationships by volume and weight - Index properties of soils - Sieve analysis - Sedimentation analysis - Atterberg limits and density index

UNIT – II

IDENTIFICATION AND CLASSIFICATION OF SOILS:

Tests for field identification and classification of soils - Textural classification, Unified soil classification and Indian Standard classification systems

SOIL WATER:

Modes of occurrence of water in soils, Adsorbed water, Capillary water - stress condition in soil - effective & neutral pressures.

UNIT – III

PERMEABILITY AND SEEPAGE:

Permeability of soil - Laboratory and field determination - Seepage analysis - Elementary principles of flow nets - Phreatic line in an Earth dam - Seepage through earth dam - Critical hydraulic gradient - Piping.

UNIT – IV

CONSOLIDATION:

Pressure - void ratio curve - Compression index - Coefficient of Compressibility - Modulus of volume change - Consolidation process - Consolidation settlement - Terzaghi's theory of one dimensional consolidation - coefficient of consolidation – Preconsolidation pressure - Normally consolidated and over consolidated soils.

UNIT – V

SHEAR STRENGTH OF SOILS:

strength of soils - Mohr'-Coulomb Failure Criteria - Measurement of shear strength - Direct shear, Unconfined compression and Triaxial compression tests - Shear strength parameters - Test conditions - Shear strength of cohesive and cohesion less soils - Drainage conditions - Pore pressure parameters.

TEXT BOOKS:

1. Geotechnical Engineering - C.Venkatramaiah
2. Numerical Problems, Examples and Objective Questions in Geotechnical Engineering - Prof.A.V.NarasimhaRao and Prof.C.Venkatramaiah
3. Soil Mechanics and Foundation Engineering - K.R.Arora.

4. Soil Mechanics and Foundation Engineering - B.C.Punmia.
5. Basic and Applied Soil Mechanics - GopalRanjan&A.S.R.Rao.
6. Soil Mechanics & Foundation Engineering – P.Purushothama.Raj

Course Outcomes (COs)

After completion of the course the student will have:
The students will be able to:

- Classify the soils based on their properties
- Assess the permeability and seepage characteristics of soil.
- Find out the settlement of soil based on the stress distribution.
- Assess the shear strength of various types of soil.
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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	1					1	1
CO2	2	2	2	2	1	2	1		1		1	1
CO3	2	2	2	2	2	2	1		1	1	1	1
CO4	2	2	2	1	1	2	1		1	1	1	1
CO5	2	2	2	2	2	2	1		1	1	1	1

CET 11 STRUCTURAL ANALYSIS – I

Instruction Hours / week :5Hrs **Credits: 4**

Course Educational Objective (CEOs)

1. To be well conversant in analyzing the internal forces in structural members with classical method of analysis in transferring the loads acting on it.

UNIT I

DEFLECTIONS:

Relationship between curvature, slope and deflection - Differential equation for the elastic line of a beam – Slope and deflection of cantilevers and simply supported beams by integration method, moment area method and conjugate beam method.

UNIT II

ENERGY METHODS:

Strain energy due to bending moment and shear forces – Maxwell's, Betti's theorems, Castigliano's first theorem and unit load method – Deflection of simple beams and pin-jointed trusses.

UNIT III

INDETERMINATE STRUCTURES:

Determination of static and kinematic indeterminacies - Solution of trusses having upto two degrees of internal and external indeterminacies – Castigliano's theorem – II – Lack of fit.

UNIT IV

STATICALLY INDETERMINATE BEAMS:

Analysis of propped cantilevers – Shear force and bending moment diagrams – Deflections.

Analysis of fixed beams with udl, point loads, uniformly varying load, couple - shear force and bending moment diagrams - Deflections – Effect of sinking of support.

UNIT V

STATICALLY INDETERMINATE FRAMES:

2. Slope deflection method, continuous beams with degree of indeterminacy not exceeding three, effect of sinking.

(ii) Moment distribution method, continuous beams and frames with sway limited to single bay single storey, effect of sinking.

TEXT BOOKS:

1) Analysis of Structures Vol.I&II by V.N.Vazirani&M.N.Ratwani.

2) Intermediate Structural Analysis by Wang.

3) Mechanics of Structures Vol.II by S.B.Junarkar.

4. Structural Analysis by L.S.Negi&R.S.Jangid.

5) Theory of Structures –Vol.I by S.P.Gupta, G.S.Pandit&R.Gupta.

6) Fundamentals of Structural Analysis by Sujit Kumar Roy & Subrata Chakrabarty.

Course Outcomes (COs)

After completion of the course the student will have:
1. Ability to apply knowledge of general structures in practice.
2. Ability to analyze statically determinate trusses, beams, frames.
3. Familiarity with professional and ethical issues and the importance of lifelong learning in structural Engineering.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	2				1	2	2	1
CO2	2	1	2	2	2				1	2	2	1
CO3	2	1	2	2	2				1	2	2	1

CET 12 ENVIRONMENTAL ENGINEERING – I

Instruction Hours / week: 4 Hrs **Credits: 4**

Course Educational Objective (CEOs)

1. To know the different sources of water and water demand.
2. To analyze the distribution network
3. To learn about the sources of water pollution
4. To know the design concepts of water treatment plant
5. To study the different aspects of Air pollution.

UNIT – I

Sources and Demand of Water

Different sources of water, quantity and quality of different sources, Types and variation in water demand, factors affecting water demand, design period, population forecasting – Different methods and their suitability.

Water Collection, Conveyance and Distribution:

Intake works for collection of surface water – Conveyance of water – Gravity and pumping – Their design – Different materials used for conveying conduits and their suitability, systems of distribution – Distribution reservoirs – Distribution networks, design of simple and complex pipe networks, pipe accessories – Valves and their location and suitability.

UNIT – I I

Water uses and Quality Requirements

Sources of water pollution, water borne, water carried and water related diseases – Need for protected water supply, water quality – Physical, chemical and biological, water quality requirement and standards for different uses.

Water Treatment:

Conventional water treatment processes units and their functions. Theory and design of aeration, coagulation, flocculation and clarification, Determination of optimum dose of alum for coagulation of water

UNIT – III

Theory of Filtration – Different types of filters and their design. Disinfection – Disinfectants mechanism of disinfection – Different types, Break point chlorination – Types of calculation – Does of disinfectant.

UNIT – IV

Advanced Treatment Methods:

Removal of fluorides, arsenic, hardness, iron and manganese, salinity, colour, organic chemical and biological residues – Adsorption with activated carbon, ion exchange resigns, membrane processes, chemical oxidation and softening.

UNIT – V

Air Pollution:

Types of pollutants, their sources and impacts, air pollution meterology, air pollution control, air quality standards and limits.

Noise Pollution:

Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution

TEXT BOOKS:

1. Water Treatment Principles and Design by James M. Montgomery.
2. Water Supply Engineering, by S.K.Garg.
3. Environmental Engineering by H.S.Peavy et al.
4. Water Supply and Sewerage, by E.W.Steel.
5. Air pollution and its Control by C.S.Rao

Course Outcomes (COs)

After completion of the course the student will have:

- Able to estimate the water demand of any area
- Able to design the distribution network system
- Able to avoid the sources of water pollution
- Able to design water treatment facility
- Able to apply advanced technologies or principles to control air pollution.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1									1	
CO2	2	2	2		1							
CO3	2	2	2		1							
CO4	2		2					2				
CO5	2	2	2		1	2	2	2				

CET 13 BUILDING PLANNING DESIGN AND DRAWING

L+D / week : 4 Hrs **Credits : 3**

Course Educational Objective (CEOs)

1. To study the factors influencing in selection of site for residential buildings.
2. To learn the different aspects of residential buildings.
3. To know the planning and design aspects of different types of buildings like residential, hospitals, school buildings etc.
4. To study the NBC Code practice need for better planning

Site selection - Functional requirements of a residential building - Principles of planning - Factors - Aspect, Prospect, Privacy, Grouping, Roominess, Water Supply and Sanitation, Flexibility, Circulation and other factors - Site plan - Planning and design of public buildings such as Residential, offices, schools, hospitals and theatres and industrial buildings, preliminaries of Vastu.

Conventional signs used in Civil Engineering Drawing, Bonds in brick masonry, stone masonry, panelled and flush doors, glazed and iron barred windows, king post truss, queen post truss.

Drawings (plans, sections and elevations) of simple residential buildings with flat roof not exceeding two storeys.

TEXT BOOKS

1. Building Planning and Drawing by Dr. N.Kumara Swamy and A.Kameswara Rao, Charotar Publishers, Anand.
2. Building Drawing by Shah, Kale & Patki.
3. Instructional Sketches for Civil Engineering Drawing - A Series & B Series.
4. Building Planning Design and Scheduling by Gurucharan Singh & Jagadish Singh.

Course Outcomes (COs)

After completion of the course the student will have:

- The scope of this course is to introduce the concepts of building planning and drawing with emphasis on architectural planning.
- This subject is designed as an introduction for students who wish to develop their competence and skills in the preparation of architectural and building drawings.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2								1	1
CO2	2	2	2								1	1

CEP 03 FLUID MECHANICS & HYDRAULICS MACHINERY LABORATORY

Practicals / week: 3 hrs. **Credits: 2**

Course Educational Objective (CEOs)

1. To conduct experiments on flow measuring devices, pipe-loss coefficients and performance characteristics of pumps and turbines

I CYCLE FLOW MEASUREMENT

1. Calibration of Small Orifice
2. Calibration of Venturimeter
3. Calibration of Orifice meter
4. Calibration of Bend meter
5. Calibration of Triangular Notch

II CYCLE HEAD LOSSES IN PIPES

1. Determination of Friction factor of the pipe material
2. Determination of Head Loss coefficient due to Sudden contraction and Sudden Expansion
3. Determination of Head loss coefficient due to Gate valve in a pipe line
4. Determination of Head Loss coefficient due to Bend in a pipe line

III CYCLE HYDRAULIC MACHINES

1. Characteristic curves of 0.4 kW single stage centrifugal pump
2. Characteristic curves of 0.8 kW two stage centrifugal pump
3. Characteristic curves of variable speed centrifugal pump
4. Characteristic curves of Pelton wheel
5. Characteristic curves of Francis/Kaplan Turbine

Course Outcomes (COs)

After completion of the course the student will have:

- To calibrate the flow measuring devices
- To calculate loss coefficients for use in the pipe-flow analysis
- To prepare the characteristic curves of the pumps and turbines

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1		2				1	1	2
CO2	2	2	2	1		2				1	1	2
CO3	2	2	2	1		2				1	1	2

CEP 04 MATERIAL TESTING LABORATORY

Practicals / Week: 2 Hrs **Credits : 1**

Course Educational Objective (CEOs)

1. The experimental work involved in the laboratory should make the student understand the fundamental modes of loading of the structures and to determine mechanical properties of materials.

1. Tension Test on Mild Steel bar
2. Tension Test on HYSD bar
3. Torsion Test
4. (a) Deflection Test on Simply Supported Beam
   (b) Charpy Impact Test
5. (a) Deflection Test on Fixed Beam
   (b) Izod Impact Test
6. (a) Compression Test on Wood
   (b) Shear Test on Wood
7. (a) Test on Closed coil Helical Spring
   (b) Bending Test on Carriage Spring
8. (a) Deflection Test on beam under Uniform Bending
   (b) Bending Test on R.S. Joist

Course Outcomes (COs)

After completion of the course the student will have:

1. To a quire the knowledge and behavior in finding the properties of different materials.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	1					1	2	

V SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
CET 14	Hydrology	4	-		4	Core	4
CET 15	Foundation Engineering-I	2	2		4	Core	3
CET 16	Design of R. C.C Structures	3	2		5	Core	4
CET 17	Elective-I (Water Power Engineering)	3	-		3	Elective	3
CET 18	Design of Steel Structures	3	2		5	Core	4
CET 19	Structural Analysis-II	3	2		5	Core	4
CEP 05	Geotechnical Engineering Laboratory			3	3	Practical	2
CEP 06	Environmental Engineering Laboratory			3	3	Practical	2
CEP 07	Survey Camp	For a period not less than 2weeks during the break between 4th and 5th semester				Practical	2*
	TOTAL	15	6	6	27		26+2*

V Semester – Syllabus

CET 14 HYDROLOGY

Instruction Hours / week : 4Hrs **Credits: 4**

Course Educational Objective (CEOs)

1. To understand the phases of hydrologic cycle
2. To analyze rainfall, abstractions and runoff

3. To learn the hydrograph analysis and the methods of estimation of floods and their routing
4. To know the basic concepts of groundwater flow and to determine the groundwater yield

UNIT I

INTRODUCTION:

Hydrologic cycle - Hydrologic data - Sources of Data.

PRECIPITATION:

Precipitation - forms and types of precipitation - Measurement of precipitation - Mean precipitation over an area - Rain guagenet work - Estimation of missing data - Intensity - Frequency - Duration curves - Depth-Area-Duration curves.

UNIT II

ABSTRACTIONS:

Evaporation, and Evapotranspiration - Factors affecting - Measurement - Methods for reduction - Infiltration - Measurement - Infiltration indices

UNIT III

RUN OFF:

Run off process - Factors affecting run off - Drainage basin characteristics - Determination of run off - Run off formulae,tables - Importance of stream gauging - Yield - Flow duration curve - Flow mass curve.

UNIT IV

FLOODS:

Importance of flood studies - Methods of estimating flood peak - Empirical formulae - Rational method - Components of a Hydrograph - Base flow separation - Unit hydrograph - Derivation of unit hydrograph of different durations - Distribution graph - Gumbles method of flood frequency analysis.

UNIT – V

FLOOD ROUTING:

Basic equation - Types - Routing by Puls and Muskingum methods

GROUND WATER:

Ground water occurrence - Darcy's law - Types of aquifers - Dupuit's equation - wells - yield - recuperation test.

TEXT BOOKS:

1. Hand Book of Applied Hydrology by VenTe Chow.
2. Engineering Hydrology by Subramanya, K. - Tata Mc Graw-Hill Publishing Co. Ltd., New Delhi.
3. Hydrology by H.M. Raghunath, Wiley Eastern Ltd., New Delhi.
4. A Text Book of Hydrology by P.Jayarami Reddy, Laxmi Publications, New Delhi.

Course Outcomes (COs)

After completion of the course the student will have:

- To develop IDF and DAD curves for use in the flood estimation
- To estimate the design flood for use in the design of hydraulic structures
- To perform flood routing for reservoir operation and stream flow control
- To arrive at groundwater yield of open and tube wells

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2	2	1	2	2	2			1		1	1	2
CO3	2	2	2	2	1			1		2	1	2
CO4	2	2	2	2	1			1		2	2	2

CET 15 FOUNDATION ENGINEERING – I

Instruction Hours / week : 4Hrs **Credits: 3**

Course Educational Objective (CEOs)

The course should enable the students to :

1. To understand the compaction behaviour of soils
2. Introduce the concept and methods of stress distribution in soils due to applied loads.
3. Introduce the principle of earth pressure and design of earth retaining structures.
4. Know about Stability of Slopes and Retaining walls.

UNIT - I

SOIL COMPACTION: Compaction of cohesive and cohesionless soils - Standard Proctor's test and Modified Proctor's test - Field compaction - Compaction control - C.B.R. test and its use.

UNIT - II

STRESS DISTRIBUTION IN SOILS : Boussinesq's equation - Vertical stress due to line load, strip load, and uniformly loaded circular area - Newmark's chart - Westergaard's approach - Pressure bulb concept - Approximate methods.

UNIT - III

STABILITY OF SLOPES : Stability analysis of infinite slopes - Stability analysis of finite slopes - Swedish circle method - Friction circle method - Taylor's stability number and use of charts - Improving stability of slopes.

UNIT – IV

EARTH PRESSURE THEORIES: Types of Earth Pressures – Earth Pressure at Rest-Active and passive earth pressures in cohesion less and cohesive soils (with and without surcharge) - Rankine's and coulomb's earth pressure theories - Graphical methods due to Rebhann and

Culmann.

UNIT - V

EARTH RETAINING STRUCTURES : Types of Retaining Structures - Stability Considerations of Gravity and Cantilever Retaining Walls - Cantilever Sheet Pile Walls - Anchored Bulk Heads (free earth support method only).

TEXT/REFERENCE BOOKS:

1. Geotechnical Engineering - C.Venkatramaiah.
2. Numerical Problems, Examples and Objective Questions in Geotechnical Engineering - Prof.A.V.NarasimhaRao and Prof.C.Venkatramaiah.
3. Soil Mechanics and Foundation Engineering - K.R.Arora.
4. Soil Mechanics & Foundations - B.C.Punmia
5. Analysis and design of foundations and retaining structures - Shamsher Prakash, GopalRanjan&Swamisaran
6. Basic and Applied Soil Mechanics - GopalRanjan&A.S.R.Rao.
7. Soil Mechanics & Foundation Engineering – P.Purushothama.Raj
8. Foundation Engineering – Teng

Course Outcomes (COs)

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

1. Can understand the compaction behaviour of soils
2. Can calculate stress distribution in soils due to applied loads.
3. Calculate earth pressure and design of earth retaining structures.
4. Analze stability of slopes and retaining walls.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1						1	1
CO2	2	2	2	2	1	1	1	2	1	2	2	1
CO3	2	1	2	2	2	1	2	1	1	1	2	1
CO4	2	2	2	2	2	1	1	2	1	1	2	1

CET 16 DESIGN OF R.C.C. STRUCTURES

Instruction Hours/ week : 5Hrs **Credits: 4**

Course Educational Objective (CEOs)

1. To understand the general mechanical behavior of reinforced concrete members.
2. Ability to analyze and design reinforced concrete flexural members and compression members.
3. To help the student develop an intuitive feeling about structural & material vise behavior and design of RC systems & elements.

UNIT – I

INTRODUCTION

Design Philosophies – working stress method, ultimate load method and limit state method.

DESIGN FOR FLEXURE – WORKING STRESS METHOD

Assumptions, permissible stresses in concrete and steel, balanced design, transformed area method, analysis and design for flexure of singly and doubly reinforced and flanged sections.

LIMIT STATE METHOD

UNIT – II

DESIGN PRINCIPLES: Basic Design Principles - Stress strain curves for concrete and steel - Characteristic strengths and loads - Partial safety factors - Stress block - Various limit states.

DESIGN FOR FLEXURE: Limit state of collapse in flexure - Ultimate flexural strength - Balanced, under-reinforced and over-reinforced sections - Design of singly and doubly reinforced rectangular beams - Design of flanged beams.

UNIT - III

DESIGN FOR SHEAR, TORSION AND BOND: Shear-Truss analogy - Design of beams for shear and torsion - Anchorage and development length.

LIMIT STATES OF SERVICEABILITY: Deflection (short and long term) - Cracking.

UNIT – IV

DESIGN OF SLABS, STAIR CASES AND BEAMS:
Design of one way and two way slabs - Design of stair cases - Design of continuous beams and slabs.

UNIT – V

DESIGN OF COMPRESSION MEMBERS: Columns - Reduction factors - Axially loaded - Eccentrically loaded columns - Uniaxial moment - Biaxial moment (for practice only and not for University Examination).

DESIGN OF FOUNDATIONS: Types of footings - Design of wall footings and isolated, pad stepped and sloped footings - Square, rectangular subjected to axial load.

TEXT BOOKS:

1) Reinforced Concrete by Limit State Design by AK Jain.
2) Reinforced Concrete Design by SN Sinha.
3) LSD of Reinforced Concrete Structures by Ramachandra.
4) Reinforced Concrete Design by Unni Krishna Pillai and DevdasMenon.
5) Reinforced Concrete Design by P.C. Varghese.

Course Outcomes (COs)

After completion of the course the student will have:

- To be in a position to design the basic elements of reinforced concrete structures. Such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice for reinforced Concrete Structures and Design.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2					1		1	1	1	

CET 17-E 5 WATER POWER ENGINEERING

Lectures / Week : 3 Hrs. **Credits: 3**

Course Educational Objectives (CEOs)

1. To know about different sources of energy
2. To understanding about low and high head plants
3. To know about design of pumped storage power plant

4. To learn about water conveyance losses

5. To know about planning of power house

UNIT I

INTRODUCTION
Introduction - Sources of Energy - Hydro-power - Estimation of Water power potential.
ELECTRICAL LOAD ON HYDRO-TURBINES
General - Load curve - Load factor - Capacity factor - Utilization factor - Diversity factor - Load duration curve - Firm power - Secondary power - Prediction of load.

UNIT II
HYDRO-POWER PLANTS
Low and High Head Plants :Classification of Hydel 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.

UNIT III
Pumped Storage Power Plants : Basic features - Advantages of pumped storage plants - Types of pumped storage plants - Relative merits of two-unit and three-unit arrangement - Reversible pump-turbines - Problems of operation - Topography, Reservoirs and water conveyance - Power house - Efficiency.

UNIT IV

WATER CONVEYANCE
Classification of penstocks - Design criteria - Economical diameter - Anchor blocks - Conduit valves - Bends and Manifolds.
Water Hammer - Resonance in Penstocks - Channel surges - Surge tanks.
Intakes - Types - Losses - Air Entrainment - Inlet Aeration - Canals - Forebay – Tunnels – Selection of Turbines.

UNIT V

POWER HOUSE PLANNING
Surface Power Station: Power House Structure - Power house dimensions - Lighting and ventilation.
Underground Power Station: Location - Types - Advantages - Components - Types of Layout - Structural Design of Power Houses

Reference Books:

1. Water Power Engineering by M.M.Dandekar and K.N.Sharma.
2. A Text Book of Water Power Engineering by R.K.Sharma and T.K.Sharma.

Course Outcomes (Cos)

- Students able to plan and design a power house in surface and subsurface.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1		1		1	1	1	

CET 18 DESIGN OF STEEL STRUCTURES

Instruction Hours / week : 5 Hrs **Credits: 4**

Course Educational Objective (CEOs)

To understand the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal provisions (IS800 – 2007)

UNIT – I

Introduction – Properties of sections – Types of loads – Permissible stresses in tension, compression, and shear as per IS code.

Riveted and bolted connections – Strength of rivet – Strength of lap and butt joints – Methods of failure and efficiency of a riveted joint - Design of riveted joints - Design of bracket connections

UNIT – II

Welded joints – Types of welded joints – Strength of fillet and butt welds - Design of welded joints - Design of bracket connections ,Design of Tension members – Lug angles – Tension splice

UNIT – III

Design of compression members – Single and built-up columns – Design of the lacing and battens – Design of eccentrically loaded columns

UNIT – IV

Laterally supported beams – Design of simple beam – Design of Built-up beams – Curtailment of flange plates

UNIT – V

Design of column bases – Slab base – Gusseted base – Bases subjected to moment – Grillage foundation.

TEXT BOOKS

1. Design of Steel Structures – (Limit State Method as per IS 800-2007) by Bhavakatti S.S.
2. Design of Steel Structures – (Limit State Method as per IS 800-2007) by N. Subramanian.
3. Design of Steel Structures – (Limit State Method as per IS 800-2007) by S.K.Duggal.

Course Outcomes (COs)

After completion of the course the student will have:

- Ability to design, tension members, compression members and ability to analyze and design of simple bolted and welded connections.
- Ability to design steel framing system and connections of a building in a team setting.
- Familiarity with professional and ethical issues and the importance of lifelong learning in structural Engineering.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2		1	1		2		1		1
CO2	2	2	1			1		1		1		1
CO3	1	1	2		1	1		2		1		

CET 19 STRUCTURAL ANALYSES – II

Instruction Hours / week : 5 Hrs **Credits: 4**

Course Educational Objective (CEOs)

1. In continuation of Structural Analysis-I to incorporate the advanced method of analysis like Matrix method and Plastic Analysis
2. Able to find the collapse loads of different structural frames.

UNIT I

KANI'S METHOD: Continuous beams, settlement of supports, single bay portal frames with side sway.

UNIT II

MULTISTOREYED FRAMES: Analysis of multistoried frames using substitute frame method, portal and cantilever methods.

UNIT III

INFLUENCE LINES AND MOVING LOADS : Influence lines for reactions, BM and SF; curves of maximum BM and SF for single, two and multipoint loads, udl longer and shorter than span, enveloping parabolic and EUDL – forces in truss members.

UNIT IV

INTRODUCTION TO MATRIX METHODS:

Flexibility and Stiffness Coefficients – Force and Displacement methods – Application to beams

UNIT V

PLASTIC ANALYSIS : Theory of plastic bending – Idealized stress - strain diagram – Shape factor - Moment - curvature relationships – Plastic hinges – Collapse Mechanisms - Analysis of fixed and continuous beams, and portal frames – Statical method and mechanism method of analysis.

TEXT BOOKS:

1) Structural Analysis by L.S.Negi&R.S.Jangid.
2) Theory of Structures Vol. I by R.S. Khurmi
3) Structural Analysis by T S Thandavamoorthy, Oxford University Press
4) Mechanics of Structures Vol.II by S.B.Junarkar.
5) Steel Structures Vol. II by Ramachandra.
6) Fundamentals of Structural Analysis – Sujit Kumar Roy &SubrataChakrabarthy

Course Outcomes (Cos)

After completion of the course the student will have:

- Ability to solve statically indeterminate structures using matrix (Stiffness & flexibility) methods.
- Ability to analysis framed structures by using appropriate methods and exact methods

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		1	2						2		1
CO2	2		1	1						2		1

CEP 05GEOTECHNICAL ENGINEERING LABORATORY

Practicals / week: 3 Hrs. **Credits :2**

Course Educational Objective (CEOs)

The course should enable the students to :

1. Develop laboratory skills in dealing with soil as a medium of water flow, for structural support and a primary building material.
2. Provide the description and classification of soil.
3. Give the procedures to measure/determine Index and Engineering properties of soil

1. a.Specific Gravity
   b.Free Swell Index
2. a.Dry Sieve Analysis
   b.In situ density by core cutter method
3. a.In situ density by sand replacement method
   b.Shrinkage Limit (Given soil)
4. Liquid Limit & Plastic Limit
5. a.Shrinkage Limit (Given dry soil pat)
   b. Density Index test

6. I.S. light compaction / Standard Proctor's compaction test
7. Hydrometer Analysis (Demonstration only)
8. Coefficient of Permeability by falling head method.
9. Coefficient of Permeability by Constant Head method.
10. a.North Dakota Cone Test
    b.California Bearing Ratio test
11. Direct Shear test
12. Unconfined Compression test
13. Triaxial compression test (Demonstration only)
14. Consolidation test (Demonstration only)

Course Outcomes (COs)

After completion of the course the student will:

1. Acquire the capacity to test the soil and assess its Engineering and Index properties
2. Apply the same to the engineering problems.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1			1		2	1	2
CO2	2	2	2	2	1			1		2	1	2

CEP 06ENVIRONMENTAL ENGINEERING LABORATORY

Practicals / Week: 3 Hrs **Credits: 2**

Course Educational Objective (CEOs)

To be aware of water quality analysis

1. (a) Determination of Color.
   (b) Determination of Taste and Temperature
2. Determination of
   (a) Total Suspended and Dissolved Solids.
   (b) Organic and Inorganic Solids.
3. (a) Determination of pH and Electrical Conductivity.
   (b) Determination of Turbidity.
4. (a) Determination of Acidity.
   (b) Determination of Alkalinity.
5. Determination of Hardness
6. (a) Determination of Chlorides.
   (b) Determination of Sulphates.
7. (a) Determination of Dissolved Oxygen.
   (b) Determination of Residual Chlorine.
8. (a) Determination of Optimum Coagulant Dose.
   (b) Determination of MPN Index of water.
9. (a) Ambient Air Quality Monitoring.
   (b) Determination of Ambient Noise.

To be aware of waste water analysis

1. (a) Determination of Color.
   (b) Determination of Odor and Temperature.
2. Determination of Total Dissolved Solids.
3. (a) Determination of Settleable Solids.
   (b) Determination of pH.
4. Determination of Total Nitrogen.
5. Determination of Total Phosphorous.
6. Determination of Sulphates
7. Determination of BOD of sewage water.
8. Determination of COD.
9. Solid Waste Analysis for physical components.

Course Outcomes (COs)

After completion of the course the student will have:

- Able to Perform common environmental experiments relating to water quality
- Able to Statistically analyze and interpret laboratory results
- Demonstrate good written and oral communication skills
- Able to Perform common environmental experiments relating to water and waste water quality
- Able to Statistically analyze and interpret laboratory results
- Able to Demonstrate good written and oral communication skills

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2		2								
CO2				2		2	1	2		2	1	
CO3				2			1	2	2	2	1	
CO4		2		2								
CO5				2		2	1	2		2	1	
CO6				2			1	2	2	2	1	

CEP 07 SURVEY CAMP

Practical's: 2 weeks **Credits: 2**

Course Educational Objective (CEOs)

1. To record all original field observations,
2. To Calculate and plots of detailed field survey using the survey equipments.
3. To Survey of Roads / Buildings
4. Preparation of Contour Maps.
5. Setting out works

Course Outcomes (COs)

After completion of the course the student will have:

- Apply various surveying principle in solving engineering survey using the survey problems
- Display team work and leadership capabilities

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	1				2	2	2
CO2	2	1	1	2	1	1				1	1	2

VI SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
CET 20	Transportation Engineering	3	2		5	Core	4
CET 21	Environmental Engineering-II	4	-		4	Core	4
CET 22	Open Elective (Green Technology)	3	-		3	Elective	3
CET 23	Quantity Surveying and Valuation	2	2		4	Core	3
CET	Foundation Engineering-	2	2		4	Core	3

24	II						
EOT 01	Managerial Economics	2	-		2	Basic	2
COT 01	Management Accounting	2	-		2	Basic	2
CEP 08	Transportation Engineering Laboratory			2	2	Practical	1
CEP 09	Technical Seminar & Presentation Skills			2	2	Practical	1
	TOTAL	18	6	4	28		23

VI Semester – Syllabus

CET 20 TRANSPORTATION ENGINEERING

Instruction Hours / week : 5Hrs **Credits: 4**

COURSE OBJECTIVES

1. Identify the requirements of highways and apply the knowledge for planning highway alignment.
2. Estimate the geometrics for highways
3. Select appropriate highway materials and design the various highway pavements.
4. Estimate the traffic requirements from traffic studies.
5. Understand the various components of Railways, Airports and Docks and Harbours.

UNIT I

HIGHWAY DEVELOPMENT AND PLANNING:

Highway Development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys

UNIT – II

HIGHWAY GEOMETIC DESIGN:

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Superelevation and Extra widening- Design of Transition Curves-Design of Vertical alignment- Gradients- Vertical curves.

UNIT - III

PAVEMENT DESIGN: Aggregates and bitumen - desirable properties, tests - Aggregate bitumen mixes - Design by Marshall method., Pavement Types, components and their functions, design factors, flexible pavement design - IRC methods based on CBR only. Rigid pavement design - Calculation of stresses, design of joints, dowel bars, tie bars, thickness of pavement by IRC

procedure.

UNIT – IV

TRAFFIC ENGINEERING:

Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams--Road Traffic Signs – Types and Specifications – Road markings- -Types of Road Markings- Design of Traffic Signals –Webster Method –IRC Method-Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections and Grade Separated Intersections - Channelisation: Objectives –Traffic Islands and Design criteria- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection.

UNIT – V

INTRODUCTION TO RAILWAY, AIRPORT AND HARBOUR ENGINEERING:

Site selection – Engineering Surveys- Permanent way components – Cross Section of Permanent Way - Points&Crossings -Turn outs- Stations and Yards.

Factors affecting selection of site for Airport – Airport layout and terminal area -Aircraft Characteristics- Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

Harbours - types of harbours, site selection- ports, classification of ports – docks - break water, types of breakwaters, quays, jetties, wharves, dolphis, fender systems, aprons, transit sheds and ware houses, dredging.

COURSE OUTCOMES

1. Estimate the requirements and design highway pavements.
2. Apprehend different components of Railways, Airports and Harbours.

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 7th edition (2000).
2. Railway Engineering – A text book of Transportation Engineering – S.P.chadula – S.Chand& Co. Ltd. – (2001).
3. Airport Planning and Design- S.K.Khanna and Arora,Nemchand Bros.
4. Docks and Harbour Engineering - S.P.Bindra.

REFERENCES:

1. Highway Engineering – S.P.Bindra , DhanpatRai& Sons. – 4th Edition (1981)
2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna publications – 6th Edition – 1997.
3. Railway Engineering – August – Prabha & Co., 15th Edition – 1994.
4. Docks and Harbour Engineering - R.Srinivasan.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1		1		1			1	
CO2	1	1				2					2	2

CET 21 ENVIRONMENTAL ENGINEERING - II

Instruction Hours / week : 4Hrs **Credits: 4**

Course Educational Objectives (CEOs)

1. To know how to estimate quantity of waste water generation from any area
2. To study the physical, chemical and biological characteristics of the waste water.
3. To learn the design concepts involved in the waste water treatment plant.
4. To know the advanced technologies involved in the waste water treatment plant.

UNIT I

WASTEWATER COLLECTION:

Sanitation - systems of sanitation, water carriage system, sewerage, systems of sewerage, sources of wastewater - Estimation of quantity of municipal wastewater - Estimation of quantity of storm water - Different types of sewers, design flows through sanitary sewers, storm sewers and combined sewers. Hydraulic design of sewers - Sewer appurtenances

House drainage and Plumbing systems

UNIT II

CHARACTERISTICS OF DOMESTIC WASTEWATER:

Characteristics and composition of sewage - Physical, chemical and biological

BOD equation and factors affecting the BOD rate of reaction, population equivalent.

PRELIMINARY AND PRIMARY SEWAGE TREATMENT:

Concept of wastewater treatment, primary, secondary and tertiary treatment - Conventional treatment process flow diagrams of municipal wastewater treatment plants - Functions of each unit Principles and design of screens, grit chamber, and primary settling tanks.

UNIT III

SECONDARY TREATMENT OF SEWAGE:

Principles of biological treatment, nutritional requirement of biological treatment system, factors affecting biological treatment systems

Design, construction, operation and maintenance of activated sludge process, oxidation ditch trickling filters and waste stabilization ponds.

UNIT IV

SLUDGE MANAGEMENT:

Quantity and characteristics, and types of sludges, sludge conditioning and dewatering, handling, treatment, sludge utilisation and disposal.

Tertiary treatment - Removal of nitrogen, phosphorus, refractory organic, heavy metals, suspended solids and pathogenic bacteria

UNIT V

EFFLUENT DISPOSAL:

Standards for disposal - disposal into surface water bodies - Self purification, zones of pollution - Dissolved oxygen sag curve- Streeter - Phelps equation, Marine disposal - On land disposal and treatment systems - overflow, flooding and irrigation.

Onsite Disposal System: Septic tank and effluent disposal system.

MUNICIPAL SOLIDWASTES:

Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/recycle, energy recovery, treatment and disposal).

TEXT BOOKS:

1. Sewage Disposal and Air Pollution Engineering, by S.K.Garg.
2. Environmental Engineering by H.S.Peavy et al.
3. Water Supply and Sewerage, by E.W.Steel and Mc.Ghee.

REFERENCE BOOKS:

1. Wastewater Engineering, Treatment, Disposal, and Reuse by Metcalf and Eddy.

Course Outcomes (Cos)

1. Able to estimate the quantity of waste water generation from any area.
2. Able to understand the impacts of mismanagement of waste water.
3. Able to apply advanced concepts in the design of waste water treatment plant.
4. Successfully apply advanced concepts of water and environmental engineering to design, analyze, and develop technologies, processes or systems to meet desired needs of society both, professionally and ethically.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1			2		2				
CO2		2					2			1		
CO3	2	2	2		2							
CO4	2	2	2		2							

CET 22 OE-01 GREEN TECHNOLOGY

Lectures / Week : 3 Hrs. **Credits:3**

COURSE OBJECTIVES

1. To create awareness on sustainability
2. To have an insight into green building technology
3. To establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on environmental, societal, and economic problems

UNIT-1

Concept of Green Buildings:

Green building initiatives, its origin, characteristics of a green building,green buildings in India, certification of green buildings rating systems (BREEAM,USGBC,LEED,IGBC,TERI-GRIHA,) criteria for rating, sustainability.

UNIT-II

Sources of Energy:

Renewable and non renewable sources of energy ; coal, petroleum, nuclear, wind, solar, hydro, geothermal sources; potential of these sources, hazards, pollution; global scenario with reference to demand and supply in India. Energy arises

Carbon Emission: Forecasting, control of carbon emission, air quality and its monitoring carbon foot print; environmental issues, minimizing carbon emission.

UNIT-III

Green Building Materials: Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; green cement, biodegradable materials, smart materials, engineering evaluation of these materials.

Green Building Planning and Specifications for green buildings

UNIT-IV

Design of Green Buildings; Sustainable sites, impact of building on environment, life cycle assessment. Design on Bioclimatic and solar passive architecture, considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design.

UNIT-IV

Construction of Green Buildings: Energy efficient construction, practices for thermal efficiency and natural lighting. Eco- friendly water proofing; ECB codes building rating, maintenance of green buildings.

COURSE OUTCOMES

The student will be:

- Able to appreciate and explain the different types of environmental pollution problems and their sustainable solutions

- Having a broader perspective in thinking for energy efficient practices by utilizing the engineering knowledge and principles gained from this course

Text Books:

1. Tropical housing and buildings climate design (1973). By Koenig's Berger Ltd, ingeesle, T-G Alan mayhew, s zokoloyS.v University press (India) pot-Ltd Hyderabad.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2			2	1	1	1	2
CO2	2				2			2	1	1	1	2

CET 23 QUANTITY SURVEYING AND VALUATION

Instruction Hours / week : 4Hrs **Credits: 3**

Course Educational Objectives (CEOs)

1. To know about the building estimation
2. To understand different floorings, roof, wood work of building construction
3. To learn about the rate analysis.
4. To gain knowledge in contracts and valuation

UNIT - I

General items of work in building - Standard units - Principles of working out quantities for detailed and abstract estimates, approximate and detailed estimates of simple buildings

UNIT - II

Standard specifications for different items of building construction - Earth work for foundations, mortors, foundation concrete - Reinforced concrete, Brick work, Stone masonry, sand, cement, kankar, lime, mosaic flooring, terrozoic flooring, RCC roof and AC roof and GI sheets, plastering, painting, pointing and wood works.

UNIT - III

Rate analysis for the following items:

Earth work for foundations and basement of buildings
Mortars: Cement mortar (1:4)
Foundation Concrete: Cement Concrete (1:5:10)
Reinforced Concrete: Lintels, slabs, beams, columns (1:2:4)
Brick work: Constructed with first class bricks with L.M. (1:1.5) and C.M (1:6
Stone masonry: C.R.S - Ist sort constructed with C.M. (1:2) and R.R.Masonry C.M (1:2).
Flooring: (a) with Cuddapah or Shahbad slabs. (b) Ellis pattern flooring with 10 cm. Concrete and 20mm cement concrete surface - Mosaic flooring.
Roofing: (a) R.C.C roof 10cm thick, 2 courses of flat tiles to top.
(b) A.C. corrugated sheet roofing on steel purlins.
Plastering: a) C.M. (1:4) 12 mm thick.
Pointing : a) with C.M (1:3) flush pointing to R.R.masonry.
b) C.M (1:3) for brick masonry.
c) Pointing to Cuddapah slab flooring.
Painting: a) White washing and colour washing of walls: 2 coats.
b) Painting iron and wood work: 3 coats.
Wood work: Panelled doors and windows.

UNIT - IV

Contracts, Types of contracts, contract document, conditions of contracts, contract procedure, termination of contracts, specification important condition of contract, arbitration and tenders.

UNIT - V

Valuation:

Introduction, technique of valuation, elements of valuation and factors affecting valuation, methods of valuation of land property and building property, rate of interest for sale, purchase, mortgage, Fixation of rent.

Valuation – Gross income, Net income, Outgoings, Scrap value, Salvage value, Obsolescence, Annuity, Capitalized value, Year's purchase, Sinking fund, Depreciation; Determination of depreciation.

TEXT BOOKS:

1. Text book of estimating and costing - B.N.Dutta.
2. Estimating Costing by G.S.Biride.
3. Valuation by Rangwala.
4. A.P.D.S.S. Standard data book Vol.II.
5. A.P.Department standard specifications.
6. Professional practice - by Roshan Namvati

Course Outcomes (COs)

After completion of the course the student will have:

- To know about the approximate or detailed estimation of simple buildings
- To be through in standard specifications in building construction
- To work on rate analysis of earth work for foundations and basement of buildings
- To be able to value a building

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				1						1	
CO2	2				2						1	
CO3	2				2						1	
CO4												

CET 24 FOUNDATION ENGINEERING - II

Instruction Hours / week : 4Hrs **Credits: 3**

Course Educational Objective (CEOs)

1. The course should enable the students to :
2. To develop and understand of the behaviour of foundations for engineering structures and to gain knowledge of the design methods that can be applied to practical problems.
3. Provide with a basic understanding of the essential steps involved in a geotechnical site investigation.
4. Introduce the principal types of foundations and the factors governing the choice of the most suitable type of foundation for a given solution.
5. Familiarize the students with the procedures used for: a) bearing capacity estimation, b) end bearing capacity, c) skin friction – pile foundation.
6. Introduce the concept of well foundation and its design and construction.

UNIT – I

SOIL EXPLORATION

Site investigations and sub-soil exploration - Site reconnaissance - Depth of exploration - Lateral extent of exploration - Test pits - Auger borings - Wash borings - Soil sampling -Split - spoon sampler -Penetration tests - Geophysical methods - Seismic refraction and electrical resistivity methods - Sub soil investigation reports.

UNIT – II

BEARING CAPACITY OF SHALLOW FOUNDATIONS

Types of foundations - Depth of foundation - Terzaghi's bearing capacity equation - Bearing capacity of square, circular, rectangular and continuous footings - Meyerhof's theory - Skempton's method - Brinch Hansen's method - Effect of ground water table on bearing capacity - - Bearing capacity from building codes.

UNIT – III

PILE FOUNDATIONS

Classification of piles - Pile driving - Load carrying capacity of piles - Dynamic formulae - Static formulae - pile load tests - Insitu penetration Tests - Group action of piles - Negative skin friction.

UNIT – IV

CAISSONS AND WELL FOUNDATIONS

Types of caissons - Bearing capacity - Construction of caissons - Advantages and disadvantages of caisson foundations - Shape and lateral size - Comparision of Caisson types - Lateral stability of caisson foundation - Terzaghi's Analysis.

UNIT – V

SETTLEMENT ANALYSIS

Types of Settlements-Tolerable settlements-Settlement Analysis of Shallow & Deep Foundations (Pile Foundations)-Cohesive & Cohesionless Soils-Settlement from Field Tests (Standard Penetration Test & Plate Load Test)

TEXT/REFERENCE BOOKS:

1. Geotechnical Engineering - C.Venkatramaiah.
2. Numerical Problems, Examples and Objective Questions in Geotechnical Engineering - Prof.A.V.NarasimhaRao and Prof. C.Venkatramaiah.
3. Soil Mechanics and Foundation Engineering - K.R.Arora.
4. Soil Mechanics & Foundations - B.C.Punmia
5. Analysis and design of foundations and retaining structures - Shamsher Prakash, GopalRanjan&Swamisaran
6. Basic and Applied Soil Mechanics - GopalRanjan&A.S.R.Rao.
7. Soil Mechanics & Foundation Engineering – P.Purushothama.Raj
8. Foundation Engineering - Teng

Course Outcomes (COs)

- After completion of the course the student will be able to:
- Learn and able to find out the Soil Profile in a given location.
- Select suitable foundation for a given structure and site.
- Expertise in the calculation of load carrying capacity of selected foundation
- Gain experience in solving field geotechnical engineering problems such as slope stability and earth retaining structures.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	2	1	2	1	1	2	1
CO2	2	2	2	2	1	1	1	2	1	2	2	1
CO3	2	1	2	2	2	1	2	1	1	1	2	1
CO4	2	1	2	2	2	1	2	1	1	1	2	1
CO5												

EOT 01 MANAGERIAL ECONOMICS

Instruction Hours / week : 2Hrs **Credits: 2**

Course Educational Objectives (CEOs)

1. To know about demand analysis.
2. To understand about cost and production supply analysis.
3. To learn about price and output decision under market structure.
4. To know about various policies and practices.
5. To learn about profit management and capital management.

UNIT I

Introduction - Nature and Scope of Managerial Economics, Economic Theory and Managerial Economics, Managerial Economist: Role and Responsibilities.
Demand Analysis and Forecasting – Demand Determinants, Demand Distinctions, Demand Forecasting: General Considerations, Methods of Demand Forecasting.

UNIT II

Cost Analysis – Cost Concepts, Classifications and Determinants; Cost-Output Relationship, Economies and Diseconomies of Scale, Cost Control and Cost Reduction
Production and Supply Analysis – Production Functions, Supply Analysis

UNIT III

Price and Output Decisions under Different Market Structures – Perfect Competition, Monopoly and Monopsony; Price Discrimination, Monopolistic Competition, Oligopoly and Oligopsony.

UNIT IV

Pricing Policies and Practices – Pricing Policies, Pricing Methods, Specific Pricing Policies, Price Discounts and Differentials; Product-line Coverage and Pricing; Price Forecasting.

UNIT V

Profit Management – Nature of Profit, Measuring Accounting Profit,
Profit Policies, Profit Planning and Forecasting.
Capital Management - Capital Budgeting, Cost of Capital, Appraising Project Profitability, Risk, Probability and Investment Decisions.

Text Book:

Varshney R L and Maheshwari K L, *Managerial Economics*, 19th Edition, Sultan Chand and Sons, 2009.

Course Outcomes (Cos)

- Estimation of cost production and supply analysis.
- Able to do Profit management with respect to goods.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			1			2					1	
CO2			1			2					1	

COT 01 MANAGEMENT ACCOUNTING

Instruction Hours / week : 2Hrs **Credits: 2**

Course Educational Objectives (CEOs)

1. To know about various principles in finance and preparing a balance sheet.
2. To understand various methods and analysis in financial statement
3. To learn about capital budgeting in accountancy.
4. To understand about analysis of marginal costing and standard cost.
5. To know about budgetary control.

UNIT I

Management Accounting – Definition, Objectives, Scope and Functions. Financial Accounting – Introduction, Process, Principles and Concepts, Financial Statements – Trading Account, Balancing Process, Profit & Loss Account and Balance Sheet

UNIT II

Financial Statement Analyses – Trend Percentage Analysis, Ratio Analysis, Fund Flow Statement Analysis, Cash Flow Statement Analysis

UNIT III

Methods of Depreciation – Straight line, Depletion, Machine Hour Rate, Diminishing Balance, Sum of Digits, Sinking Fund and Insurance Policy Methods.
Inventory Valuation Methods – FIFO, LIFO, Average Weighted Average, Base Stock and HIFO Methods

UNIT IV

Capital Budgeting – Pay Back Period, ARR, NPV, PI and IRR Methods.
Unit Costing – Introduction, Direct Cost Classification and Indirect Cost Classification.
Introduction to Process Costing, Job Costing and Activity Based Costing

UNIT V

Marginal Costing – Introduction, Definition, Meaning and BEP Analysis and BEP in units.
Standard Costing – Introduction, Variance Analysis Material Cost Variance, Material Price Variance, Labor Variance, and Sales Variance.
Budgetary Control – Introduction and Classification of Budgets, Production, Material / Purchase, Sales, Sales Overhead, Cash and Factory Overheads Budgets. Flexible Budget

Text Book:
Pandikumar M P, *Management Accounting: Theory and Practice*, 1st Edition, Excel Books, 2007.

UNIT	Chapters
I	1,2 and 3
II	5,6,7 and 8
III	4 and 11
IV	9,10, 13 , 14 and 18

V	15, 16 and 17

REFERENCE BOOK:

Khan M Y, Jain P K, *Management Accounting*, 4th Edition, Tata McGraw-Hill, 2007

Course Outcomes (Cos) :

- Students are able to prepare a balance sheet Budgeting
- Optimization of cost benefit analysis

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			1	2		1						
CO2			1	2		1						

CEP 08 TRANSPORTATION ENGINEERING LAB

Instruction Hours / week : 2Hrs **Credits: 1**

Course Educational Objective (CEOs)

1. To enable to study different highway construction materials.
2. To facilitate students to perform different tests on highway construction materials.

CYCLE – I

1. Specific Gravity and Water Absorption Test.
2. Aggregate Impact Test
3. Elongation Index Test
4. Flakiness Index Test
5. Angularity Test
6. Los Angles Abrasion Test
7. Aggregate Crushing Test
8. Stripping Value of Aggregate

CYCLE – II

1. Flash & Fire Point Test
2. Softening point Test
3. Specific Gravity of Bitumen
4. Penetration Test on Bitumen
5. Ductility Test

Course Outcomes (COs)

After completion of the course the student will have:

Able to perform various tests for selection of various materials used in highway construction

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1				1		1	2	2

CEP 09 TECHNICAL SEMINAR & PRESENTATION SKILLS

Practical / week: 2 Hrs. **Credits: 1**

Course Educational Objectives (CEOs)

- Ability for effective oral, written communication and presentation skills.
- To broaden education necessary to understand the impact of engineering solutions in a global and societal context.
- Preparation of technical presentations on identified area related to Civil Engineering
- Critical discussion on the presentations.
- Submission of a report on technical seminar.

Course Outcomes (Cos)

- An understanding of professional and ethical responsibility.
- Recognition of the need for, and an ability to engage in life-long learning.
- Knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				1					1		1	
CO2				2					2		1	
CO3				1					1		1	
CO4				2					2		1	

VII SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
CET 25	Remote Sensing & GIS	3	-		3	Core	3
CET 26	Structural Dynamics and Design of Earthquake Resistant Structures	4	-		4	Core	4
CET 27	Irrigation &Hydraulic Structures	3	2		5	Core	4
CET28	Elective-II (Planning and Development of Water resources projects)	3	-		3	Core	3
CET29	Professional Ethics	3	-		3	Core	3
MAT 04	Numerical Methods	3	-		3	Basic	3
CEP 10	Concrete Technology Laboratory			2	2	Practical	1
CEP 11	CAD laboratory			3	3	Practical	2
	TOTAL	19	2	5	26		23

VII Semester – Syllabus

CET 25 REMOTE SENSING & GIS

Instruction Hours /week: 3 Hrs. **Credits:3**

Course Educational Objective (CEOs)

1. To introduce the basic concepts and principles of various components of remote sensing, and provide an exposure to GIS.

UNIT – I

Remote Sensing Principles:

Definition - Remote Sensing Process – Electromagnetic Radiation (EMR) – Radiometric quantities – Sources of EMR –Interaction of EMR with Atmosphere – Atmospheric Windows – Interaction of EMR with Earth Surface Features - Vegetation, Soils, Water - Spectral Signature- Advantages and limitations of Remote Sensing.

Remote Sensing Systems:

Platforms - Introduction - Types - Satellites - Indian Remote Sensing Satellites – Sensors – Introduction - Types - Characteristics of Sensors – Data Products, Visual data analysis. Image interpretation techniques – Elements of

image interpretation

UNIT – II

Geo-referencing Principles
Mapping: Introduction – Maps Categories –Coordinate Systems –Geographic Coordinate system – Geoid-Spheroid- Ellipsoid – Datums – Map projections – Establishing spatial frame work for mapping – Georeferencing – Acquisition of spatial data and attribute data for thematic mapping

UNIT – III

Digital Image Processing: Introduction - Overview - Preprocessing - Radiometric correction - Geometric correction - Rectification. Enhancement Techniques - Contrast stretch - Edge enhancement - Filtering Techniques - Classification Techniques - Supervised and unsupervised classification.

UNIT – IV

Geographical Information System : Basic Principles - Definition - Components - Data Structures - Raster and Vector formats - Functioning of GIS - Data Input - Data Manipulation - Data Retrieval - Data Analysis - Data Display.

UNIT – IV

Applications of RS and GIS:
Land use and Land cover; Agriculture – Forestry – Geology – Geomorphology – Hydrology

REFERENCE BOOKS

1. F.F.Sabins Jr., Remote Sensing Principles and Interpretation.
2. P.J.Curran, Principles of Remote Sensing.
3. Lille and Kiefer, Remote Sensing Principles and Image Interpretation.
4. C.P.Lo, Principles of Geographic Information Systems.
5. J.R.Jensen, Principles of Remote Sensing.
6. Remote Sensing and GIS by B Bhatta, Oxford University Prtess

Course Outcomes (Cos)

After completion of the course the student will:

- Be able to manage, manipulate and analyze spatial data using GIS technology
- To produce a student who can contribute effectively to the use of image analysis and GIS techniques.
- Knowledge of remote sensing sensors & platforms their properties

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		1	1						1	2
CO2	2	2		1	1						1	2
CO3	2	2		1	1						1	2

CET 26 STRUCTURAL DYNAMICS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

Instruction Hours / week : 4Hrs **Credits: 4**

Course Educational Objective (CEOs)

- Able to find the response of the structures subjected to dynamic loads.
- Abilities to analysis and design of Earthquake resisting Structures.

UNIT I

THEORY OF VIBRATIONS:

Introduction- Elements of a vibratory system – Degrees of Freedom –Free and Forced –Undamped and Damped– Vibrations

SINGLE DEGREE OF FREEDOM SYSTEM:

Formulation and solution of the equation of motion –Response of Free vibration system – Critical damping – Logarithmic decrement –Response to harmonic excitation –Dynamic magnification factor

UNIT II

MULTI DEGREE OF FREEDOM SYSTEM

Formulation of equations of motion of MDOF- Evaluation of structural property matrices – undamped free vibrations –Evaluation of natural frequencies and mode shapes.

UNIT III

ENGINEERING SEISMOLOGY

Earthquake phenomenon – cause of earthquakes – Seismic waves – Terms associated with earthquakes – Magnitude and intensity of an earthquake –Scales – Energy released – Earthquake measuring instrument –Seismic zones of India.

UNIT IV

INTRODUCTION TO EARTHQUAKE RESISTANT DESIGN

Concept of earthquake resistant design – Regular and irregular configurations – Design Earthquake loads – Basic load combinations – Lateral load resisting systems – Determination of design lateral forces – Equivalent lateral force procedure – Lateral distribution of base shear – provisions of IS: 1893(part I)- 2002

UNIT V

DUCTILE DETAILING

Ductility – definition –Types –Choice of construction materials –Unconfined concrete – Confined concrete – Factors affecting Ductility – Ductile detailing provisions as per IS:13920-1993 – Ductile detailing of beams, columns and beam-column joint.

TEXT BOOKS

1. Mario Paz - Structural Dynamics Theory and Computations, CBS Publishers
2. Anil Kumar Chopra, Dynamics of Structures, Prentice Hall India Pvt. Ltd.
3. O Pankaj Agarwal& Manish Shrikhonde - Earthquake Resistant Design of Structures, Prentice Hall India Pvt. Ltd.

REFERENCES:

1. R.W.Clough&J.penzien, Dynamics of Structures, Mc. Graw Hill Publications,
2. J.J.Humar, Dynamics of Structures, Prentice Hall India Pvt. Ltd.
3. Jaikrishna& Chandra Sekar Elements of Earthquake Engineering, South Asian Publications N.D.

Course Outcomes (COs)

After completion of the course the student will have:
1. Able to find the response of the structures subjected to dynamic loads.
2. Abilities to analysis and design of Earthquake resisting Structures

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		1	1		1	1		1		2
CO2	2	2		1	1		1	1		1		2

CET 27 IRRIGATION & HYDRAULIC STRUCTURES

Instruction Hours / week : 5Hrs **Credits: 4**

Course Educational Objectives (CEOs)

1) To calculate the irrigation requirements of crops
2) To understand the components and design concepts of diversion and storage head works
3) To learn the hydraulic design principles of spillways and energy dissipaters

UNIT I

IRRIGATION ENGINEERING:

Benefits and ill effects of Irrigation - Methods of irrigation - Duty and Delta - Irrigation efficiencies - Irrigation water requirements - assessment of Irrigation water - crop seasons - principal crops - Rotation of crops- effects, causes and prevention of Water logging.

UNIT II

IRRIGATION STRUCTURES

Falls – Necessity and location – Classification Regulators – Head and cross regulators - cross drainage works – Types – Selection of suitable type of C.D. work – Escapes - canal outlets – Types.

UNIT III

DIVERSION HEAD WORKS:

Location of diversion head work - Components - Causes of failure of weirs and remedial measures - Bligh's and Khosla's theories of design of weirs on permeable foundation - Design of vertical drop and sloping glacis weir.

UNIT IV

STORAGE HEAD WORKS:

Types of dams - Site selection and Reservoir Planning - Forces acting on and causes of failure of a gravity dam - Elementary and practical profiles - Stability analysis - Single and multiple step methods of design - Grouting.

UNIT V

SPILLWAYS:

Requirements, components and types of spillways - Design principles of ogee spillway - Methods of energy dissipation below spillways - Effect of TWC and JHC - Scour protection below spillways - Stilling basins and its appurtenances - Hydraulic design of energy dissipaters - Crest gates.

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic Structures - P.N.Modi.
2. Irrigation Engineering and Hydraulic Structures - S.K.Garg.
3. A text book of Irrigation Engineering and Hydraulic Structures - R.K.Sharma.
4. Irrigation and Water Power Engineering – B.C.Punmia and Dr.Pande.
5. Irrigation and Water Resources and Water Power Engineering – Dr. P.N.Modi.

Course Outcomes (Cos)

- To plan irrigation projects and management of irrigation water
- To design weirs, barrages and dams

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	2			1		1	1	2
CO2	2	2	1	2	2			1		1	1	2

CET28-E5 PLANNING AND DEVELOPMENT OF WATER RESOURCES PROJECTS

Lectures / Week : 3 Hrs. **Credits: 3**

Course Educational Objective (CEOs)

- To understand the steps involved and common pitfalls I planning of water resources projects.
- To know the different types of projects, costs, benefits and study the importance of cost-benefit analysis.
- To learn the various mathematical aspects of discounting formulae and methods relating to engineering economy.
- To analyze the various aspects of flood control and river basin planning.
- To know the functions and rights related to water law and study some related case studies.

UNIT I

INTRODUCTION:

Significance of planning of Water Resources Projects - Steps involved in planning of Water Resources Projects - Common pit falls - Agencies for collection.

UNIT II

COST AND BENEFIT OF WATER RESOURCE PROJECTS

Single Purpose and Multi Purpose Projects - Comparison - Compatibility among different benefits - Cost - Types - Benefits - Types - Allocation of joint costs

UNIT III

ENGINEERING ECONOMY

Approach to engineering economic study - Discounting formulae such as compound amount formula, present with formula, capital recovery formula, series present worth formula - Discounting methods such as present worth method, rate of return method, annual cost method and benefit cost method.

UNIT IV

FLOOD CONTROL AND RIVER BASIN PLANNING

Types of flood control planning - Economic analysis of flood control projects - Estimation of flood damages - Estimation of flood control benefits.

Types of river basin planning - Integrated River water management.

UNIT V

WATER LAW

Introduction - Sources, functions of law - Ripanian status and ripanian rights - Special cases such as Narmada, Almatti and Cauvery, Babli

REFERENCES:

1. N.S.Grigg "Water Resources Planning"
2. K.N.Duggal et al "Elements of Water Resources Engineering."

Course Outcomes (COs)

After completion of the course the student will have:

- Able to design an optimum water resources project by considering aspects of cost-benefit analysis.
- Able to apply the knowledge of flood control and river basin planning.
- Application of the functions and rights related to water law.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2		1	1	1	1		1		2
CO2	2	2	2		1	1	1	1		1		2
CO3	2	2	2		1	1	1	1		1		2

CET 29 PROFESSIONAL ETHICS

Instruction Hours / week : 3Hrs **Credits: 3**

Course Educational Objectives (CEOs)

1. To include senses of engineering ethics
2. To educate about the responsibilities and rights of employee during their profession.

UNIT – I

ENGINEERING ETHICS

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - consensus and controversy – Models of Professional Roles - Self-interest

UNIT – II

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law

UNIT – III

ENGINEER'S RESPONSIBILITY FOR SAFETY

Safety and risk - assessment of safety and risk - risk benefit analysis - reducing risk - the Government Regular's Approach to Risk.

UNIT – IV

RESPONSIBILITIES AND RIGHTS

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT – V

GLOBAL ISSUES

Multinational corporations - Environmental ethics - computer ethics - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of conduct.

TEXT BOOK

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Professional Ethics", Prentice Hall of India, 2004.
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw-Hill, New York 2005.
3. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning 2000.
4. Charles B. Fledderman, Engineering Ethics, Pearson Education, New delhi, 2004.

Course Outcomes (Cos)

1. Ability to apply ethics while decision making during their profession.
2. Enable to feel their responsibility and rights delivering the goods during their profession.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						1	2	2	1	2	2	1
CO2						1	2	1	2	1	1	2

MAT 04 NUMERICAL METHODS

Instruction Hours / week : 3Hrs **Credits: 3**

Course objectives:

- To learn the integration and differentiation
- To gain knowledge in linear equations by different methods
- To know the solutions for linear and non-linear equations

UNIT I :
Finite Differences and Difference Equations

Finite Difference, the Difference Operator - properties of Difference Operators - Difference Tables - other Difference Operators

Difference Equation - formation, linear Difference Equations, Complementary Function and particular integral, Difference Equations reducible to linear forms, simultaneous Difference Equations with constant coefficients

UNIT-II:
Numerical Interpolation, Integration & Differentiation
Newton's forward & backward interpolation formula - Lagrange's interpolation formula - Numerical differentiation by Richardson's extrapolation - Numerical integration by Romberg method

UNIT - III:
Solutions of Algebraic & Transcendental Equations:
Determination of roots of non - linear equations by iterative methods - Falsi position method - Newton Raphson method - Multiple roots by Newton Raphson method - Complex roots by Mueller's method.

UNIT - IV:
Solution of linear and non-linear algebraic equations
Iterative methods - Gauss elimination with pivotal condensation - Triangular factorization methods – ill condition systems - Gauss Seidal& Newton Raphson iterative methods - Comparison of convergence properties of GS & NR iterative techniques.

UNIT - V:
Solution of ordinary & partial differential equations
Euler's method - Euler's modified method - RungeKutta second & fourth order methods - RungeKutta Gill method - Milne's predictor and corrector methods for first order equations

Finite Difference approximation to derivatives, solutions of Laplace, Poisson equations by iterative methods

TEXT BOOK:
1. Higher Engineering Mathematics – B.S.Grewal
2. Numerical methods by E. Balagurusamy, Tata McGraw-Hill Publishing Co.

3. Numerical Methods for Scientific and Engineering Computation 3 rd edition by Jain, New Age International

Course Outcomes:

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

1. Develop analytical skills for the problems involving differential equations
2. Develop skills in analyzing linear and non-linear algebraic equations
3. Develop skills in the design of mathematical equations and arrive at numerical solutions involving integrations and differential equations

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2		2						1	1
CO2	2	2	2		2						1	1
CO3	2	2	2		2						1	1

CEP 10 CONCRETE TECHNOLOGY LABORATORY

Practicals / week : 2Hrs **Credits: 1**

Course Educational Objective (CEOs)

1. To find the properties of ingredients or concrete
2. To know the properties of fresh & hardened concrete under different loading conditions.

1. Sieve Analysis of coarse and fine aggregates
2. Bulking of Sand by Volume and Weight methods
3. Normal consistency, Initial and Final Setting Times of Cement
4. Tests on concrete
a. Slump Test
b. Compressive Strength of Concrete Cubes
c. Compaction Factor Test
d. Compressive Strength of Concrete Cylinders

5. (a) Specific gravity & Water absorption of Coarse aggregate
   (b)Specific gravity of Cement
6. Water absorption and Compressive Strength of Bricks

Course Outcomes (Cos)

After completion of the course the student will be:

1. Able to fine the quality of materials used in concrete and the properties of hardened concrete.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1					1		1		

CEP 11CAD LABORATORY

Practicals / week: 3 Hrs. **Credits: 2**

Course Educational Objectives (CEOs)

1. To acquire hands on experience in design and preparation of structural drawings for concrete / steel structural normally encountered in civil engineering practices

Analysis and Design

1. Axial members
2. Beams
3. Plane Trusses
4. Space Trusses
5. Plane Frames
6. Space Frames

Software: AutoCAD

1. Buildings with load bearing walls (Flat and pitched roof) – Including details of doors and windows
2. RCC framed structures
3. Industrial buildings – North light roof trusses
4. Perspective view of one and two storey buildings

Software: Any Civil Engineering Analysis Software (STAAD Pro, STRAP, ETABS etc)

1. 2-D Frame analysis and design
2. Steel tabular truss analysis and design
3. 3-D Frame analysis and design
4. Retaining wall analysis and design
5. Simple tower analysis and design
6. Analysis and design of solid slab and RCC Tee beam bridges for IRC loading

Course Outcomes (Cos)

1. Ability to apply computer aided design techniques to complete all phases to top-down civil engineering design problems.
2. Use computer aided software techniques to prepare and deliver written and drawing presentation of design specifications
3. Understanding to interpret the detailing drawing of components with relevant IS codes.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2		1					1		
CO2	2	2	1		2					1		
CO3	2	2	2		1	1				1		

VIII SEMESTER

Course Code	Course Title	Instruction Hours per Week				Course Type	Credits
		Theory	Tutorial	Lab.	Total		
CEP 12	Project work	-	3		3	Core	6
CEP 13	Mini Project/Internship	-	-		-	Core	2
CET 30	Elective-III(MOOCS)	3	-		3	Core	3
CET 31	Construction Planning & Project Management	4	-		4	Core	4
CEP 14	GIS Lab	-	-	3	3	Core	2
	TOTAL	7	3	3	13		17

VIII Semester – Syllabus

CEP 12 PROJECT WORK

Practicals / week : 3 Hrs **Credits: 6**

Course Educational Objectives (CEOs)

- To enable the students to work in convenient group on a project involving theoretical and experimental studies related to Civil Engineering
- Carrying out project work in the chosen area of Civil Engineering
- Preparations of Detailed Project Report

Course Outcomes (Cos)

1. To enable the students to work in convenient group
2. Capable of doing a project involving theoretical and experimental studies.
3. Modern trend and technology in civil engineering

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2		1		2	1	
CO2	2	2	2	1	1	2		2		2	2	
CO3	2	2	1	2	1	1		1		1	1	

CET 31 CONSTRUCTION PLANNING & PROJECT MANAGEMENT

Instruction Hours / week : 4 Hrs **Credits: 4**

Course Educational Objectives (CEOs)

1. Able to plan construction projects, schedule the activities determine and control the cost of the project, by creating cash flows and budgeting.
2. Understand the operation of construction equipment.
3. To know the labor and safety laws, quality control and ethical audit in construction industry.

UNIT I

INTRODUCTION:

Significance of construction management, Objectives and functions, Construction types, Resources, Stages in construction, personnel involved in construction planning and their roles, Engineering drawings, specifications and tender documents and their importance in planning.

Scheduling and control, Advantages, Classification of scheduling, Methods of planning and scheduling, Bar charts (Gnat charts), and Mile stone charts.

UNIT II

CPM and PERT ,Comparison between CPM and PERT, Network techniques terminology, Event and activity, Network representation, AON and AOA system, Development of net-work, errors and dummies in net-work logic, calculation of network(CPM) times, floats and slacks, project scheduling and critical path, superficial path, Up-dating, Resources smoothening and leveling.

Cost-time analysis in Net-work planning, Importance of time-cost analysis, Direct costs and Indirect costs, Operation time-cost Trade off graphs, Normal and crash points, Project

Time-cost Trade, off curves, optimizing project costs, Recompression of multiple critical paths, Crash limit and free float limit, optimization of costs.

UNIT III

CONSTUCTION EQUIPMENT:

Engineering Fundamentals ,classification, rolling resistance, Rim pull, Coefficient of friction ,Conditions of Management factor, Coefficient of traction swelling and shrinkage of soils, Selection of construction equipment, Depreciation, Methods of cost reduction in construction, Earth Moving Equipment, Excavating plants and equipment, Transporting equipment, earth compaction equipment, Earth spreading Equipment, Equipment for concrete construction.

UNIT IV

Progress control, purpose, Methods of recording progress, Recording and analysis of progress, corrective action, productivity and methods to increase productivity, work study, Time-study, operation analysis, process charts.

Organizing construction: Types of organization, Details, Principles of organization, Details, Organizational relationship, organization charts, Functions of different personnel involved in organizing construction, Types of contracting firms, Temporary services, Job Layout.

Inspection and Quality Control: Importance of Inspection and quality control, principles of Inspection, Enforcement of specifications, stages of Inspection and quality control, Testing services and Inspection Team, Testing of structures, Different types of tests, Assessment of quality of construction work.

UNIT V

Construction Labour: Status of construction worker, Types of labor, Wages, Trade unions, Trade union Act 1936,Labour welfare fund Act 1965,payment of wages Act, Minimum wages act, Contract labor Act, Industrial dispute Act, Factories Act.

Safety in construction Industry: Importance of safety, Accidents, causes and safety measures in construction Industry, Safety campaign.

ETHICAL AUDIT

Introduction, Aspects of project realization, Ethical audit procedures, The decision makers, Variety of interests, Formulation of briefs, The environment ,The audit statement, The audit reviews.

TEXT BOOKS

1. Construction Planning and Management by P.S.Gohlot and B.M.Dhir, Wiley Eastern Limited, New Delhi (1992).
2. Construction Equipment and its Management by S.C.Sarma, Khanna Publishers, Delhi (1995).
3. Engineering Ethics by M.GovindaRajan, S.Natarajan and V.S.Senthilkumar, Prentice-Hall of India Pvt. Ltd. (2004), New Delhi (Chapters 4 and 7).
4. Construction Management and Accounts by J.L.Sharma, SatyaPrakashan Publications, New Delhi.
5. Construction Engineering and Management by S.Seetharaman, Umesh Publications, Delhi (1997).
6. Construction Management and Accounts by Harpal Singh, Tata McGraw-Hill Publishing Limited, New Delhi.
7. PERT and CPM: Principles and Application.3rd edn.-L.S.SrinathAffliated East-West press pvt.Ltd. New Delhi.
8. Planning and control with PERT and CPM -Richard,Levin and Charles A.Kirkpatrick Tata McGraw-Hill publishing Co.Ltd,New Delhi.

Course Outcomes (Cos)

1. Compute and sketch CPM and PERT diagram.
2. Assemble and sketch scheduling of construction activities in construction industry.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			2		2	1	1			2	2	
CO2			2		2	1	1			2	2	

CEP 14 GIS LAB

Practicals / week: 3 Hrs. **Credits: 2**

Course Educational Objectives (CEOs)

1. To gain practical experience in using spatial data in GIS environment.

1. Concept of GIS – Understanding Map projections
2. Map projections – preliminaries
3. Topographic map interpretation
4. Introduction to ILWIS software
5. Spatial data input
6. Spatial data management
7. Spatial data analysis

Course Outcomes (Cos)

1. Ability to handle spatial data in GIS environment
2. Analysis and data management of spatial data for solution of engineering projects.

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CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2	2	1					1		
CO2	2		2	2	1					1		