COURSE STRUCTURE

for

CIVIL ENGINEERING
(B.Tech)

PRAGATI ENGINEERING COLLEGE
(Autonomous)

Permanently Affiliated to JNT University Kakinada and Approved by AICTE, New Delhi,
Accredited by NAAC with "A" Grade
Recognized by UGC 2(f) and 12(b) under UGC act, 1956
1-378, ADB Road, Surampalem – 533 437, Near Peddapuram, E.G.Dist., A.P.

I Year – I Semester

S. No.	Sub Code	Subject	L	T	P	C
1	16BH1T01	English – I	3	1	--	3
2	16BH1T03	Mathematics – I	3	1	--	3
3	16BH1T11	Engineering Chemistry	3	1	--	3
4	16CS1T01	Computer Programming using C	3	1	--	3
5	16ME1T01	Engineering Mechanics	3	1	--	3
6	16BH1T13	Environmental Studies	3	1	--	3
7	16BH1L01	English – Communication Skills Lab - I	--	--	3	2
8	16CS1L10	C Programming Lab	--	--	3	2
9	16BH1L05	Engineering/Applied Chemistry Lab	--	--	3	2
Total Credits						**24**

I Year – II SEMESTER

S. No.	Sub Code	Subject	L	T	P	C
1	16BH2T02	English – II	3	1	--	3
2	16BH2T04	Mathematics – II(Mathematical Methods)	3	1	--	3
3	16BH2T06	Mathematics – III	3	1	--	3
4	16ME2T02	Engineering Drawing	3	1	--	3
5	16ME2T03	Elements of Mechanical Engineering	3	1	--	3
6	16BH2T09	Engineering Physics	3	1	--	3
7	16ME2L01	Engineering Workshop & IT Workshop	--	--	3	2
8	16BH2L02	English – Communication Skills Lab - II	--	--	3	2
9	16BH2L03	Engineering/Applied Physics lab	--	--	3	2
10	16BH2L04	Engineering/Applied Physics-VirtualLab-Assignments	--	--	2	---
Total Credits						**24**

II Year – I SEMESTER

S. No.	Sub Code	Subject	L	T	P	C
1	16EE3T03	Basic Electrical and Electronics Engineering	3	1	--	3
2	16BH3T08	Probability & Statistics	3	1	--	3
3	16CE3T01	Building Materials & Construction	3	1	--	3
4	16CE3T02	Fluid Mechanics	3	1	--	3
5	16CE3T03	Strength of Materials-I	3	1	--	3
6	16CE3T04	Surveying	3	1	--	3
7	16CE3L01	Strength of Materials Lab	--	--	3	2
8	16CE3L02	Surveying Field work-I	--	--	3	2
9	16BH3T17	Professional Ethics & Human Values	--	--	3	---
Total Credits						**22**

II Year – II SEMESTER

S. No.	Sub Code	Subject	L	T	P	C
1	16CE4T05	Building Planning & Drawing	3	1	--	3
2	16CE4T06	Concrete Technology	3	1	--	3
3	16CE4T07	Engineering Geology	3	1	--	3
4	16CE4T08	Hydraulics & Hydraulic Machinery	3	1	--	3
5	16CE4T09	Strength of Materials-II	3	1	--	3
6	16CE4T10	Structural Analysis -I	3	1	--	3
7	16CE4L03	Fluid Mechanics & Hydraulic Machinery Lab	--	--	3	2
8	16CE4L04	Surveying Field work-II	--	--	3	2
9	16BH4T15	Management Science	2	--	--	--
10	16CE4S01	Seminar	2	--	--	--
Total Credits						**22**

III Year – I SEMESTER

S. No.	Sub Code	Subject	L	T	P	C
1	16BH5T14	Managerial Economics & Financial Analysis	3	1	--	3
2	16CE5T11	Design & Detailing of Reinforced Concrete Structures	3	1	--	3
3	16CE5T12	Geotechnical Engineering - I	3	1	--	3
4	16CE5T13	Structural Analysis - II	3	1	--	3
5	16CE5T14	Transportation Engineering - I	3	1	--	3
6	16CE5L05	Concrete Technology Lab	--	--	3	2
7	16CE5L06	Engineering Geology Lab	--	--	3	2
8	16CE5L07	Geotechnical Engineering Lab	--	--	3	2
9	16CE5M01	MOOCS	2	--	--	--
10	16BH5T16	IPR & Patents	2	--	--	--
Total Credits						**21**

III Year – II SEMESTER

S. No.	Sub Code	Subject	L	T	P	C
1	16CE6T15	Environmental Engineering-I	3	1	--	3
2	16CE6T16	Geotechnical Engineering-II	3	1	--	3
3	16CE6T17	Transportation Engineering - II	3	1	--	3
4	16CE6T18	Water Resource Engineering -I	3	1	--	3
5		**Open Elective**	3	1	--	3
	16EC6E03	1. Electronics Instrumentation				
	16CS6E04	2. Data Base Management System				
	16EE6E05	3. Alternative Energy Systems				
	16CE6E01	4. Waste Water Management				
	16CE6E02	5. Fundamentals of Liquefied Natural Gas				
	16CE6E03	6. Green Fuel Technology				
6	16CE6L08	Environmental Engineering Lab	--	--	3	2
7	16CE6L09	Transportation Engineering Lab	--	--	3	2
8	16CE6P01	Mini Project/Term Paper	--	--	--	2
Total Credits						**21**

IV Year – I SEMESTER

S. No.	Sub Code	Subject	L	T	P	C
1	16CE7T19	Design & Detailing of Steel Structures	3	1	--	3
2	16CE7T20	Environmental Engineering - II	3	1	--	3
3	16CE7T21	Remote Sensing & GIS Applications	3	1	--	3
4	16CE7T22	Water Resource Engineering-II	3	1	--	3
5	16CE7D01 16CE7D02 16CE7D03 16CE7D04 16CE7D05 16CE7D06	**Elective –I** 1. Finite Element Method 2. Ground Improvement Techniques 3. Air Pollution & Control 4. Urban Hydrology 5. Repair & Maintenance of Structures 6. Traffic Engineering	3	1	--	3
6	16CE7D07 16CE7D08 16CE7D09 16CE7D10 16CE7D11 16CE7D12	**Elective –II** 1. Earthquake Resistant Design 2. Advanced Foundation Engineering 3. Advanced Structural Engineering 4. Pavement Analysis & Design 5. Ground Water Development 6. Environmental Impact Assessment & Management	3	1	--	3
7	16CE7L10	Irrigation Drawing & CAED Practice	--	--	3	2
8	16CE7L11	GIS & CAD Lab	--	--	3	2
Total Credits						**22**

IV Year – II SEMESTER

S. No.	Sub Code	Subject	L	T	P	Credits
1	16CE8T23	Construction Technology & Management	3	1	--	3
2	16CE8T24	Estimating, Specifications & Contracts	3	1	--	3
3	16CE8T25	Prestressed Concrete	3	1	--	3
4	16CE8D13 16CE8D14 16CE8D15 16CE8D16 16CE8D17	**Elective – 3** 1. Soil Dynamics & Machine Foundation 2. Solid And Hazardous Waste Management 3. Bridge Engineering 4. Water Resource System Planning 5. Transportation Planning Engineering	3	1	--	3
5	16CE8P02	Project Work	--	--	--	10
6	16CE8S02	Seminar on Internship Project/Comprehensive Evaluation	--	--	3	2
Total Credits						**24**

Total Course Credits = 48 + 44 + 42 + 46 = 180

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L	T	P	C
3	1	0	3

I Year I Semester

Subject Code: 16BH1T01

ENGLISH – I

Introduction:
In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students have to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering. As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The non-detailed Textbooks are meant for extensive reading for pleasure and profit. Thus, the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:
To improve the language proficiency of the students in English with emphasis on LSRW skills.
1. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
2. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:
Objectives:
1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:
Objectives:
1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like role-plays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:
Objectives:
1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.

4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The classes are to be learner-centred where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

DETAILED TEXTBOOKS:

- *ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by Orient Blackswan Pvt Ltd*
- *THE COP AND THE ANTHEM BY O. HENRY PUBLISHED BY PERFECTION LEARNING*

NON-DETAILED TEXTBOOK:

- *-PANORAMA: A COURSE ON READING, Published by Oxford University Press India*

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

Objective:

To develop human resources to serve the society in different ways.

Outcome:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

Objective:

To develop extensive reading skill and comprehension for pleasure and profit.

Outcome:

Acquisition of writing skills

UNIT 2:

1. ' Transport: Problems and Solutions' from English for Engineers and Technologists.

Objective:

To highlight road safety measures whatever be the mode of transport.

Outcome:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

Objective:

To develop extensive reading skill and comprehension for pleasure and profit.

Outcome:

Acquisition of writing skills

UNIT 3:

Unit 3 has two sections: Unit 3(A) and 3(B)

3(A):

1. 'Evaluating Technology' from English for Engineers and Technologists.

Objective:

To highlight the advantages and disadvantages of technology.

Outcome:

The lesson creates an awareness in the readers that mass production is ultimately survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

Objective:

To develop extensive reading skill and comprehension for pleasure and profit.

Outcome:

Acquisition of writing skills

Unit 3(B)

- *1. THE COP AND THE ANTHEM BY O.HENRY*

Objective:

To enable students to develop interest in reading and appreciating short stories of different genres.

Outcome:

This lesson motivates students to respond and express the ideas and feelings in the story through oral, written and performative means.

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

Objective:

To bring into focus different sources of energy as alternatives to the depleting sources.

Outcome:

The lesson helps to choose a source of energy suitable for rural India.

2. ' The Scarecrow' from Panorama : A Course on Reading

Objective:
To develop extensive reading skill and comprehension for pleasure and profit.
Outcome:
Acquisition of writing skills.

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

Objective:
To highlight the fact that animals must be preserved because animal life is precious.
Outcome:
The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

Objective:
To develop extensive reading skill and comprehension for pleasure and profit.
Outcome:
Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

Objective:
To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.
Outcome:
The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

Objective:
To develop extensive reading skill and comprehension for pleasure and profit.
Outcome:
Acquisition of writing skills

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

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I Year I Semester

Subject Code: 16BH1T03

MATHEMATICS – I

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

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

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Solve linear differential equations of first, second and higher order.
4. Calculate total derivative, Jocobian and minima of functions of two variables.

UNIT I: Linear systems of equations

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordon- Gauss Jacobi and Gauss Seidel methods.

Applications: Finding the current inelectrical circuits.

UNIT II: Eigen values - Eigen vectors

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powersof a matrix by using Cayley-Hamilton theorem- Diagonalization.

Applications: Free vibration of a two-mass system.

UNIT III–Quadratic forms

Quadratic formsReduction of quadratic form to canonical form – Rank - Positive, negative and semi definite- Index – Signature.

UNIT IV: Differential equations of first order and first degree

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonaltrajectories-Electrical circuits- Chemical reactions.

UNIT V: Linear differential equations of higher order

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type , , , polynomials in , , ( ) – Method of Variation ofparameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT VI: Partial differentiation

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain ruleGeneralized Mean value theorem for single variable (without proof)-Taylor's and McLaurent's series expansion of functions of two variables - Jacobian– Functional dependence. **Applications:** Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali,** Engineering Mathematics, Lakshmi Publications.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India

Reference Books:

1. **Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
4. **Srimanta Pal, SubodhC.Bhunia**, Engineering Mathematics, Oxford UniversityPress.
5. **Dass H.K., RajnishVerma. Er**, Higher Engineering Mathematics, S.Chand Co.Pvt. Ltd, Delhi.

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L	T	P	C
3	1	0	3

I year - I semester

Subject Code: 16BH1T11

ENGINEERING CHEMISTRY

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

UNIT I: HIGH POLYMERS AND PLASTICS

Polymerisation:- Definition- Types of Polymers - Mechanism of polymerization- Stereo regular polymers- Methods of polymerization(emulsion and suspension)-Physical and Mechanical properties. Plastics as engineering materials: advantages and limitations- Thermoplastics and Thermosetting plastics Compounding and fabrication (Compression, Injection, Extrusion and Blown Techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon, Poly methyl Methacrylate (PMMA) *and* polycarbonates

Elastomers :- Natural rubber- Disadvantages- Mastication - compounding and vulcanization - Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes - Applications of elastomers.

Composite materials & Fiber reinforced plastics - Biodegradable polymers - Conducting polymers.

Learning Objectives: Plastics are nowadays used in household appliances; They are also used as composites (FRP) in aerospace and automotive industries.

Outcomes: The advantages and limitations of plastic materials and their use in design would be understood.

UNIT II: FUEL TECHNOLOGY

Fuels – Definition –Classification - Characteristics of a good fuel - Calorific value - HCV and LCV - Dulong's formula - Bomb calorimeter – Numerical problems - Coal -- Proximate and Ultimate analysis and their Significance - Liquid fuels - Petroleum- Origin and Refining - Cracking - Synthetic petrol - Petrol knocking - Diesel knocking - Octane and Cetane ratings - Anti-knock agents - Power alcohol – Bio diesel, Gaseous fuels: - Natural gas, LPG and CNG, Combustion - Calculation of air for the combustion of a fuel, Flue gas analysis – Orsat's apparatus - Numerical problems on combustion

Explosives:- Rocket fuels

Learning Objectives: Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence are introduced to create awareness on the topics.

Outcomes: Fuels which are used commonly and their economics, advantages and limitations can be understood by the students and create awareness on the topics.

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells - Single electrode potential - Electro chemical series and uses of this series- Standard electrodes (Hydrogen ,Calomel and Glass electrode) - Concentration Cells - Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc - air cells.

Fuel cells: - Hydrogen Oxygen fuel cells - Methanol Oxygen fuel cells

Corrosion :- Definition - Theories of Corrosion (chemical & electrochemical) - Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion - Passivity of metals -Pitting corrosion – *Corrosion under insulation* -Galvanic series - Factors which

influence the rate of corrosion –Protection from corrosion -Design and material selection - Cathodic protection - Protective coatings: - Surface preparation - Metallic (galvanizing and tinning) coatings - Methods of application on metals (Electroplating, Electroless plating).

Learning Objectives: The basics for the construction of galvanic cells are introduced to have understanding on the concepts. Understanding on the concept of Corrosion and Mechanism of Corrosion with Theories like Electrochemical theory. .

Outcomes: Corrosion – its theories and controlling methods can create Understanding and awareness on the topic.

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction - Sol-gel method & chemical reduction method of preparation- Characterization by Braunear Emmett Teller(BET) method, Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM) methods - Carbon nano tubes : Types, preparation(*Laser ablation, Chemical vapour deposition methods*), properties and applications, Fullerenes.

Liquid crystals:- Introduction - Types - Applications

Super conductors:-Type -I, Type II - Characteristics and applications

Green synthesis:- Principles of Green Chemistry - Methods of synthesis (Aqueous Phase Method, Super Critical Fluid Extraction and Phase Transfer Catalysis) with examples - R_4M_4 principles

Learning Objectives: With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced in **Unit – IV.**

Outcomes: The students will have awareness on now aware of materials like nano materials and fullerenes and their applications. Study on liquid crystals and superconductors can create Understanding for their applications in various fields. The importance of green synthesis create better Understanding for application and also can create better Understanding compared to conventional methods is also explained.

UNIT V: WATER TECHNOLOGY

Hard water:- Reasons for hardness - units of hardness - determination of hardness and alkalinity - Water for steam generation - Boiler troubles - Priming and Foaming, Scale formation, Boiler corrosion, Caustic embrittlement - Internal treatments - Softening of Hard water : Lime - Soda process, Zeolite process and numerical problems based on these processes and Ion Exchange process - Water for drinking purposes Purification - Sterilization and disinfection : Chlorination, Break point chlorination and other methods - Reverse Osmosis and Electro Dialysis.

Learning Objectives: Water is necessary in almost all the industries, more so where steam is generated and also where it is supplied for drinking purposes. Problems associated with Water quality Methods to be used to Control or remove the Hardness

Outcomes: The impurities present in raw water, problems associated with them and how to eliminate them can be understood.

UNIT VI: *CHEMISTRY OF ENGINEERING MATERIALS*

Refractories: - Definition, classification, characteristics (Thermal conductivity, Porosity, Refractoriness, *Refractoriness under load*) and failures

Lubricants: - Definition, function, *Types of lubricants*, properties (Definition and importance)
Cement: - Constituents, manufacturing, hardening and setting, decay of concrete.
Bio Materials:- Definition – Characteristics- Applications
Insulators: - Thermal and electrical insulators

Learning Objectives: Materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries are introduced with a Special emphasis on Refractories, Lubricants, Cement, Insulators, Bio materials and fuel cells.

Outcomes: The advantages and limitations of plastic materials and their use in design would be understood. Awareness on commonly used industrial materials can create better Understanding on the Usage of Materials Used for various applications.

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy,P. Shankar and others, University Press, IIM

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I Year - I Semester

Subject Code: 16CS1T01

COMPUTER PROGRAMMING USING C

Learning objectives:
Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editingand executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:
History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:
Introduction to C Programming- Identifiers, The main () Function, The printf () Function P**rogramming Style** - Indentation, Comments, Data Types**,** Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.
Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:
Control Flow-Relational Expressions - Logical Operators:
Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.
Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, while Statement, for Statement, Nested Loops, do-while Statement.

UNIT-IV
Modular Programming: Function and Parameter Declarations, Returning a Value, Functions withEmpty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.
Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:
Arrays & Strings
Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays asFunction Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices.
Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:
Pointers, Structures, Files
Pointers: Concept of a Pointer, Initialization of pointer variables, pointers as function arguments,passing by address, Dangling memory, address arithmetic, character pointers and functions,pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures,nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:
- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:
1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, B. L.Juneja, Anita Seth, Cengage Delmar Learning India Pvt.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:
1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, R S Bichkar, University Press, 2012.
3. Programming in C, ReemaThareja, Oxford.
4. C by Example, Noel Kalicharan, Cambridge University Press.

URLs

1. http://nptel.ac.in/courses/106104128/
2. http://students.iitk.ac.in/programmingclub/course/#notes
3. http://c-faq.com/~scs/cclass/cclass.html
4. http://www.youtube.com/watch?v=b00HsZvg-V0&feature=relmfu
5. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/

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L	T	P	C
3	1	0	3

I Year - I Semester

Subject Code: 16ME1T01

ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction, Problems on wedges.

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT IV

Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia:

Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies, Principle of virtual work.

UNIT – VI

Objectives: The students are to be exposed to concepts of work, energy and particle motion

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method., Law of conservation of momentum

TEXT BOOKS :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engg. Mechanics - S. S. Bhavikatti, New Age International.

REFERENCES :

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications
10. http://nptel.ac.in/courses/Webcourse-contents/IIT-ANPUR/engg_mechanics/ui/Course_home_3.htm
11. http://nptel.ac.in/courses/122104015/
12. https://www.youtube.com/watch?v=LG0YzGeAFxk

PRAGATI ENGINEERING COLLEGE : SURAMPALEM
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I year - I semester

Subject Code: 16BH1T13

ENVIRONMENTAL STUDIES

UNIT – I

Course Learning Objectives: Basic understanding of the environment, global problems and ecosystems.
Course Outcomes: The importance of environment and global environmental problems. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

Multidisciplinary nature of Environment and Ecology: Definition, Scope and Importance, *Introduction to Brief works of noted Environmentalists & Naturalists(Wangari Mathai,Salim Ali and Sunderlal Bahuguna)* ,Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.
Ecosystems: Concept of an ecosystem**,** Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. Classification of ecosystems-**_**characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems: Estuaries and Mangroves

UNIT – II

Course Learning Objectives: Overall understanding of the natural resources
Course Outcomes: The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.
Natural Resources: Natural resources and associated problems
Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people
Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Laterite, Coal, Sea and River sands.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III

Course Learning Objectives**:** Basic understanding of Biodiversity.
Course Outcomes: The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels.

India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity.

UNIT – IV

Course Learning Objectives: Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
Course Outcomes: Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, *Heavy Metal pollution*, Soil pollution, Noise pollution, Radioactive pollution: Sources and risks. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Style, Impact of Fire Crackers on Man and his well being.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e - waste management.

UNIT – V

Course Learning Objectives: Awareness on the social issues, environmental legislation and global treaties
Course Outcomes: Social issues both rural and urban environment and the possible means to combat the challenges. The environmental legislations of India and the first global initiatives towards sustainable development.
Social Issues and the Environment: Urban problems related to energy -Water conservation- *Coastal Regulatory zone management,* rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air(Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI

Course Learning Objectives: An understanding of the environmental impact of developmental activities
Course Outcomes: About environmental assessment and the stages involved in EIA and the environmental audit. Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking & Curriculum.
Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. *Environmental Modeling: Definition (Box Model and Gaussian Plume Modeling),* Ecotourism, Green Campus – Green business, Green politics *and Green Building.*
The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

TEXT BOOKS:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P.N. Palanisamy, P. Manikandan, A. Geetha, and K.Manjula Rani; Pearson Education, Chennai

REFERENCE:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
5. Environmental pollution, Monitoring and Control by Khopkar.S.M, New Age Publishers.
6. *A Text Book of Fundamentals of Ecology, E.P.Odam, Philadelphia: W.B. Saunders Company.*

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I Year - I Semester

Subject Code:16BH1L01

ENGLISH - COMMUNICATION SKILLS LAB- I

PRESCRIBED LAB MANUAL FOR SEMESTER I:
'INTERACT: English Lab Manual for Undergraduate Students', Published by Orient Black swan Pvt Ltd.

Objectives:
To enable the students to learn through practice the communication skills oflistening, speaking, reading and writing.

Outcome:
A study of the communicative items in the laboratory will help the students become successful in the competitive world. The course content along with the study material is divided into six units.

UNIT 1:
1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks -- Practice work.

UNIT 2:
1. Responding to Requests and asking for Directions -- Practice work.

UNIT 3:
1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing -- Practice work.

UNIT 4:
1. Letters and Sounds -- Practice work.

UNIT 5:
1. The Sounds of English -- Practice work.

UNIT 6:
1. Pronunciation
2. Stress and Intonation -- Practice wor

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

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I Year - I Semester

Subject Code:16CS1L10

C PROGRAMMING LAB

OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures a File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics
a) What is an OS Command, Familiarization of Editors - vi, Emacs
b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
c) Write a C Program to perform Adding, Subtraction, Multiplication and Division of two numbers from Command line

Exercise - 2 Basic Math
a) Write a C Program to Simulate 3 Laws at Motion
b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I
a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
b) Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II
a) Write a C Program to Find Whether the Given Number is
   i. Prime Number
   ii. Armstrong Number
b) Write a C program to print Floyd Triangle
c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions
a) Write a C Program demonstrating of parameter passing in Functions and returning values.
b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III
a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch…case
b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values ofsin x and cos x and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays
Demonstration of arrays
a) Search-Linear.
b) Sorting-Bubble, Selection.
c) Operations on Matrix.

Exercises - 9 Structures
a) Write a C Program to Store Information of a Movie Using Structure
b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers
a) Write a C Program to Access Elements of an Array Using Pointer
b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations
a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.
Understand the difference between the above two programs.

Exercise – 12 Strings
a) Implementation of string manipulation operations **with** library function.
i) copy
ii) concatenate
iii) length
iv) compare
b) Implementation of string manipulation operations **without** library function.
i) copy
ii) concatenate
iii) length
iv) compare

Exercise -13 Files
a) Write a C programming code to open a file and to print it contents on screen.
b) Write a C program to copy files

Exercise - 14 Files Continue
a) Write a C program merges two files and stores their contents in another file.
b) Write a C program to delete a file.

OUTCOMES:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analysing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

Note:

a) All the Programs must be executed in the Linux Environment. (Mandatory)
b) The Lab record must be a print of the LATEX (.tex) Format.

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I year - I semester

Subject Code: 16BH1L05

ENGINEERING/APPLIED CHEMISTRY LAB

1. Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Quantitative analysis etc.,
2. Trial experiment – Estimation of HCI using standard Na2co2 solutions
3. Estimation of KMnO4 using standard Oxalic acid solution.
4. Estimation of Ferric iron using standard K2Cr2O7 solution
5. Estimation of Copper using standard K2Cr2O7 solution.
6. Estimation of Total Hardness water using standard EDTA solution.
7. Estimation of Copper using standard EDTA solution.
8. Estimation of Copper using Colorimeter
9. Estimation of pH of the given sample solution using pH meter.
10. Conductometric Titrations between strong acid and strong base
11. Conductometric Titrations between strong acid and Weak base
12. Potentiometric Titrations between strong acid and strong base
13. Potentiometric Titrations between strong acid and Weak base
14. Estimatinog of Zinc using standard potassium ferrocyanide solution
15. Estimation of Vitamin – C

STANDARD BOOKS :

1. Dr.Jyotsna Cherukuis(2012)Laboratory Manual of Engineering Chemistry-II, VGS Techno Series
2. Chemistry Practical Manual, Lorven Publications
3. K. Mukkanti (2009) Practical Engineering Chemistry, B.S. Publication

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I year - II semester

Subject Code: 16BH2T02

ENGLISH-II

Introduction:

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

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The non-detailed Textbooks are meant for extensive reading for pleasure and profit. Thus the stress in the syllabus in primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like role-plays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

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WRITING SKILLS

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The classes are to be learner-centred where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches) of Pragati Engineering College, Surampalem from the academic year 2016-17 (R-16 Regulations)

DETAILED TEXTBOOK:

- *ENGLISH ENCOUNTERS Published by Maruthi Publishers.*

- A BETTER INDIA, A BETTER WORLD by N.R. Narayana Murthy,Published by: Penguin Books India Pvt. Ltd.

DETAILED NON-DETAIL:

- *THE GREAT INDIAN SCIENTISTS, Published by Cengage learning*

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

Objective:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

Outcome:
The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

Objective:
The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.
Outcome:
Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. ' A Dilemma' from English Encounters

Objective:
The lesson centres on the pros and cons of the development of science and technology.
Outcome:
The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

Objective:
The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

Outcome:
The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

Unit 3 has two sections: Unit 3(A) and 3(B)

3 (A)

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

Objective:
The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences
Outcome:
The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

Objective:
The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear program as architect.
Outcome:
The seminal contributions of HomiJehangirBhabha to Indian nuclear program provide an aspiration to the readers to serve the nation and strengthen it.

Unit 3 (B)

1.'What can we learn from West?' from A Better India, A Better World

Objective:
To enable students to appreciate the differences in cultural perspectives.
Outcome:
This lesson motivates students to develop a multicultural outlook and appreciate the diverse cultures.

UNIT 4:

1. 'The Lottery' from English Encounters.

Objective:

The lesson highlights insightful commentary on cultural traditions.

Outcome:

The theme projects society's need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

Objective:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

Outcome:

The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. ' The Health Threats of Climate Change' from English Encounters.

Objective:

The essay presents several health disorders that spring out due to environmental changes

Outcome:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. ' Prafulla Chandra Ray' from The Great Indian Scientists.

Objective:

The lesson given is an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

Outcome:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

Objective:

The lesson supports the developments of technology for the betterment of human life.

Outcome:

Pupil gets inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

Objective:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

Outcome:

The lesson provides inspiration to the readers to think and tap their innate talents

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I year - II semester

Subject Code: 16BH2T04

MATHEMATICS – II
(Mathematical Methods)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

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

1. Solve the numerical problems which will be the platform for engineering problems.
2. Determine Fourier series, Fourier Transforms of the given functions.
3. Solving the higher order partial differential equations.

UNIT I: Solution of Algebraic and Transcendental Equations

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (Onevariable and simultaneous Equations).

UNIT II: Interpolation

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton'sformulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations

Trapezoidal rule- Simpson's 1/3rd and 3/8th rule-Solution of ordinary differential equations by Taylor's seriesPicard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

UNIT IV: Fourier Series

Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

UNIT V: Fourier Transforms

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT VI: Partial Differential Equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations. Classification of second order partial differential equations.

Applications: Method of separation of Variables- Solution of One dimensional Wave, Heat and twodimensional Laplace equations.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.
3. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Reference Books:

1. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath**and **P.Vijayalakshmi**, Mathematical Methods, Himalaya Publishing House.
3. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
4. **Srimanta Pal, SubodhC.Bhunia**, Engineering Mathematics, Oxford University Press.
5. **Dass H.K., RajnishVerma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

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I year - II semester

Subject Code: 16BH2T06

MATHEMATICS – III

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skillsand techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base todevelop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

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

1. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
2. Determine double integral over a region and triple integral over a volume.
3. Calculate gradient of a scalar function, divergence and curl of a vector function.Determine line, surface and volume integrals. Apply Green, Stokes and Gaussdivergence theorems to calculateline, surface and volume integrals.

UNIT I: Laplace transforms
Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function.
UNIT II: Inverse Laplace transforms
Inverse Laplace transforms – Shifting Theorems - Transforms of derivatives and integrals - Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.
UNIT III: Multiple integrals
Curve tracing: Cartesian, Polar and Parametric forms.
Multiple integrals: Double and triple integrals – Change of variables – Change of order ofintegration.
Applications: Finding Areas and Volumes.
UNIT IV: Special functions
Beta and Gamma functions- Properties - Relation between Beta and Gamma functions -Evaluation of improper integrals.
Applications: Evaluation of integrals.
UNIT V: Vector Differentiation
Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.
Applications: Equation of continuity, potential surfaces
UNIT VI: Vector Integration
Line integral – Work done – Potential function – Area- Surface and volume integrals Vectorintegral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) andrelated problems.

Applications: Work done, Force.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Reference Books:

1. **Greenberg**, Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Peter O'Neil**, Advanced Engineering Mathematics,7th edition, Cengage Learning.
3. **D.W. Jordan and T.Smith**, Mathematical Techniques, Oxford University Press.
4. **Srimanta Pal, SubodhC.Bhunia**, Engineering Mathematics, Oxford University Press.
5. **Dass H.K., RajnishVerma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

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I year - II semester

Subject Code: 16ME2T02

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I
Objective: To introduce the students to use drawing instruments and to draw polygons, Engineering Curves.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.
Unit II
Objective: To introduce the students to use scales and orthographic projections, projections of points.
Scales: Plain scales, diagonal scales and vernier scales
Orthographic Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants. Projections of lines, lines parallel either to the reference planes (HP, VP or PP)
Unit III
Objective: The objective is to make the students draw the projections of simple lines inclined to one or both the planes.
Projections of lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT.
Unit IV
Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.
Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.
Unit V
Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

Unit VI
Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.
Conversion of isometric views to orthographic views, Conversion of orthographic views to isometric views.

TEXT BOOKS:

1. Engineering Drawing by N.D. Bhatt, Chariot Publications
2. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age International

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers
5. http://nptel.ac.in/courses/112103019/
6. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html
7. http://www.engineeringdrawing.org

Course Outcomes:

- Provides the students with a background in descriptive geometry, orthographic & isometric projection, engineering drawing techniques. Points, lines and plane relationships in projection, multi-view engineering drawings, basic dimensioning, engineering applications.
- Student's ability to perform basic sketching techniques will improve. Students will be able to draw orthographic projections.
- Student's ability to convert sketches to engineered drawings will increase.

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L	T	P	C
3	1	0	3

I year - II semester

Subject Code: 16ME2T03

ELEMENTS OF MECHANICAL ENGINEERING

Learning Objectives: The content of this course shall provide the student the basic concepts of various mechanical systems and exposes the student to a wide range of equipment and their utility in a practical situation. It shall provide the fundamentals of Steam, I.C. Engines, compressors, manufacturing methods and transmission systems that usually exist in engineering.

UNIT –I:

Steam boilers: Classification of boilers, essentialities of boilers, selection of different types of boilers, study of boilers, boiler mountings and accessories. Performance of boilers. Working principle of steam turbines.

UNIT-II:

Metal joining: arc welding, resistance welding, gas welding, brazing and soldering
Metal forming: forging – operations, rolling and extrusion principles
Machine tools: lathe classification, specifications, and operations.

Casting: Steps involved in making a casting – Advantages and applications. – Patterns and Pattern making

UNIT-III:

Reciprocating and rotary air compressors: uses of compressed air, types, working principle, work done, simple problems.

Refrigeration: concepts, principle of refrigeration and types of refrigeration.

UNIT-IV:

Internal combustion engines: classification of IC engines, basic engine components and nomenclature, working principle of engines, Four strokes and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, simple problems such as indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.

UNIT-V:

Belts –Ropes and chains: belt and rope drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, centrifugal tension in a belt, power transmitted by belts and ropes, initial tensions in the belt, simple problems.

Unit VI

Gears: classification of gears, gear ratio, law of gearing, gear profiles, applications.

Gear trains: classification of gears, gear trains velocity ratio, simple, compound and reverted gear trains and simple problems.

Outcomes:

- After completing the course, the student shall be able to understand the applications of different mechanical elements and manufacturing processes.
- The performance of components like Boiler, I.C Engine, Compressors.
- Power transmission by belt, rope, chain and gear trains.

Text Books:

1. Mechanical Engineering Science K R Gopala Krishna, Subhas publications
2. Thermal Engineering, Ballaney,P.L., Khanna Publishers, 2003
3. Elements of Mechanical Engineering, A.R.Asrani, S.M.Bhatt and P.K.Shah, B.S. Publs.
4. Elements of Mechanical Engineering, M.L.Mathur, F.S.Metha & R.P.Tiwari Jain Brothers Publs., 2009.
5. Production Technology by P.N.Rao by I & II McGraw-Hill publications

Reference Book:

1. Theory of Machines, S.S. Rattan, Tata McGraw Hil , 2004 & 2009.

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L	T	P	C
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I year - II semester

Subject Code: 16BH2T09

ENGINEERING PHYSICS

COURSE OBJECTIVES: Physics curriculum which is re-oriented to the needs of non Circuital branches of graduate engineering courses.. That serves as a transit to understand the branch specific advanced topics. The courses are designed to:

- Impart concepts of Optical Interference, Diffraction and Polarization required to design instruments with higher resolution - Concepts of coherent sources, its realization and utility optical instrumentation.
- Study the Structure-property relationship exhibited by solid crystal materials for their utility.
- Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.
- To explore the Nuclear Power as a reliable source required to run industries
- To impart the knowledge of materials with characteristic utility in appliances.

UNIT-I

Objective: To impart knowledge on interference phenomenon and utilising it to design of instruments in Engineering applications.

Outcome: The students will learn to apply the concepts of interference undergo analysis of optical effects and contribute to engineering applications.

INTERFERENCE: Introduction-Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry)- Interference in wedge shaped films – Newton's rings –working principle of Interferometer, applications

UNIT-II

Objective: To impart knowledge on diffraction phenomenon to design optical instruments for Engineering applications.

Outcome: The students will learn to study diffraction pattern of light to utilize in the analysis of the materials and their properties.

DIFFRACTION: Introduction -Fraunhoffer diffraction at single slit - Cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes- applications.

UNIT-III

Objective:

- ***To impart knowledge on types of polarization, types of polarizing materials and their effects to study and design of optical instruments.***
- ***To impart knowledge on the lasers & their working principle***

Outcome: The students will learn polarization phenomenon, Lasers and their practical implications in engineering applications.

POLARIZATION: Introduction -Types of Polarization – Methods of production – double refraction-Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polari meter (Sacharimeter)-applications.

LASERS: Introduction- Characteristics– Stimulated emission – Einstein's Transition Probabilities-Pumping schemes - Ruby laser – Helium Neon laser-applications of lasers

UNIT-IV

Objective: To impart knowledge on fundamentals of acoustic principles & methods of production of Ultrasonic waves and study their practical applications.

Outcome: The student will learn the basics of architectural acoustics for structural designing & production of Ultrasonic waves for practical applications.

ACOUSTICS: Introduction- Acoustics of concert hall- -. Reverberation time – Sabine's formula - Absorption Coefficient and its Measurement- Effecting factors and Remedies.

ULTRASONICS: Introduction -Production by Magnetostriction & Piezo electric effect- Detection Methods- Ultrasonic transducers -Non Destructive Testing-Applications.

UNIT-V

Objective: To impart knowledge on study of structure of materials, property relationship exhibited by the solid state materials for their utility and to explore the nuclear power as a reliable source required to run industries

Outcomes.

- ***The students will learn the structures and properties of solid state materials.***
- ***The students will learn the fundamentals of Nuclear Physics & production of nuclear energy using technology.***

CRYSTALLOGRAPHY & X-RAY DIFFRACTION: Introduction-Basis and lattice – Unit cell - Coordination number -Bravais lattice-Crystal Systems- Packing fractions –Crystal directions and planes- Miller indices – Separation between successive (h k l) planes – Bragg's law - Bragg's X-ray spectrometer.

NUCLEAR ENERGY – SOURCE OF POWER: Mass defect & Binding Energy – Fusion and Fission as sources – Fast breeder Reactors.

UNIT-VI

Objective: To impart knowledge on materials with characteristic utility in appliances.

Outcome: The students will learn effects of magnetic & dielectric properties of materials & will apply such materials in various applications of engineering.

MAGNETISM: Introduction-Basics of Magnetism-Origin of Magnetic Moment -Classification of Magnetic Materials- Weiss theory-Domain Theory-Hysteresis- Eddy Current Losses- -Hard and soft Magnetic materials- applications

DIELECTRICS: Electric Polarization – Dielectrics in DC and AC fields – Internal field – Clausius - Mosotti Equation - Loss, Breakdown and strength of dielectric materials – Ferroelectric Hysteresis and applications.

COURSE *OUTCOME*: *Construction and working details of instruments, ie., Interferometer, Diffract meter and Polarimeter are learnt. Study Acoustics, crystallography magnetic and dielectric materials enhances the utility aspects of materials.*

Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshirasagar, S.Chand & Company Ltd., (2014)

2. Physics for Engineers by M.R.Srinasan, New Age international publishers (2009)

Reference books:

1.Physics by Resnick,Halliday&Krane ,Volume I&II ,John Wiley&sons(2002)

2. Engineering Physics by D.K.Bhattacharya and Poonam Tandon , Oxford press (2015)

3. Applied Physics by P.K.Palanisamy , Scitech publications (2014)

4. Lasers and Non-Linear optics by B.B.Laud , Newage international publishers (2008

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I year - II semester

Subject Code: 16ME2L01

ENGINEERING WORKSHOP & IT WORKSHOP

ENGINEERING WORKSHOP:

Course Objective: To impart hands-on practice on basic engineering trades and skills.
Note: At least two exercises to be done from each trade.

Trade:

Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tenon Joint

Fitting

1. V Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black Smithy

1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House Wiring

1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Tin Smithy

1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

IT WORKSHOP

OBJECTIVES:

- Understand the basic components and peripherals of a computer.
- To become familiar in configuring a system.
- Learn the usage of productivity tools.
- Acquire knowledge about the netiquette and cyber hygiene.
- Get hands on experience in trouble shooting a system?

1. **System Assembling, Disassembling and identification of Parts / Peripherals**

2. **Operating System Installation**-Install Operating Systems like Windows, Linux along with necessary Device Drivers.
3. **MS-Office / Open Office**
    a. **Word** - Formatting, Page Borders, Reviewing, Equations, symbols.
    b. **Spread Sheet** - organize data, usage of formula, graphs, charts.
    c. **Power point** - features of power point, guidelines for preparing an effective presentation.
    d. **Access**- creation of database, validate data.
4. **Network Configuration & Software Installation**-Configuring TCP/IP, proxy and firewallsettings. Installing application software, system software & tools.
5. **Internet and World Wide Web**-Search Engines, Types of search engines, netiquette, cyber hygiene.
6. Trouble Shooting-Hardware trouble shooting, Software trouble shooting.
7. **MATLAB-** basic commands, subroutines, graph plotting.
8. **LATEX**-basic formatting, handling equations and images.

Outcomes:

- PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.
- Internet & World Wide Web introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet.
- Usage of web browsers, email, newsgroups and discussion forums, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks will be introduced.
- Productivity tools will enable the students in crafting professional word documents, excel spread sheets and power point presentations using the Microsoft suite of office tools and LaTeX.
- Basic usage of MATLAB toolboxes will be introduced.

Text Books:

1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition by Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press, 2002.
5. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008
6. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.
7. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
8. Introduction to Information Technology, ITL Education Solutions limited, PearsonEducation.

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I year - II semester

Subject Code: 16BH2L02

ENGLISH - COMMUNICATION SKILLS LAB- II

PRESCRIBED LAB MANUAL FOR SEMESTER II:
'INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd.
OBJECTIVES: To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.
OUTCOME: A study of the communicative items in the laboratory will help the students become successful in the competitive world.
The course content along with the study material is divided into six units.

UNIT-1:

1.Debating- Practice work

UNIT-2:

1.Group Discussion- Practice work

UNIT-3:

1.Presentation Skills- Practice work

UNIT-4:

1.Interview Skills- Practice work

UNIT-5:

1.Email
2.Curriculum Vitae- Practice work

UNIT-6:

1.Idiomatic Expressions
2.Common Errors in English- Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

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L	T	P	C
0	0	3	2

I year - II semester

Subject Code: 16BH2L03

ENGINEERING/APPLIED PHYSICS LAB

(only 10 out of 14 Experiments prescribed)

1. To verify the Laws of Transverse vibrations of a stretched string using sonometer
2. To determine the Rigidity Modulus of a given wire using Torsional Pendulum
3. To determine the velocity of sound in air using Volume Resonator Method
4. To determine the acceleration due to gravity using Compound Pendulum
5. To determine the frequency of an electric tuning fork using Melde's Apparatus
6. To Study the V-I Characteristics and determine the breakdown voltage of a Zener Diode
7. To determine the wavelength of a given source using diffraction Grating in Normal Incidence Method
8. To determine the energy Band Gap of a Semiconductor using P-N Junction diode
9. To Study the variation of the Magnetic field along the axis of a current carrying circular coil using Stewart and Gee's Apparatus
10. To study the R-I Characteristics of a Themistor
11. To determine the refractive index of the medium of the film using the formation of Newton's Rings.
12. To determine the thickness of a paper using the formation of parallel fringes
13. To Determine Planck's constant using photoconductor
14. To determine the refractive index of the Prism using spectrometer

Reference :

1. Engineering Physics Lab Manual by Dr.Y.Aparna & Dr.K.Venkatesswara Rao.(V.G.S. Book Links)
2. Physics Manual cum Observation book (College Designed Manual).

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L	T	P	C
0	0	2	0

I year - II semester

Subject Code: 16BH2L04

ENGINEERING/APPLIED PHYSICS-VIRTUAL LAB ASSIGNMENTS

(Constitutes 5 marks of 40 marks of Internal-component)

List of Experiments
1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Numerical Aperture of Optical fiber
6. Photoelectric Effect
7. Simple Harmonic Motion
8. LASER – Beam Divergence and Spot size
9. B-H curve
10. Michelson's interferometer

URL : www.vlab.co.in

-

II Year – I SEMESTER	L	T	P	C
	3	1	0	3

16CE3T01 -BUILDING MATERIALS & CONSTRUCTION

Course Learning Objectives:

To develop knowledge of building materials

1. To learn the availability, types, uses and various tests for building materials.
2. To know about materials that is used for protection and functional purpose.
3. To know about various components of building.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Know about the Manufacturing Processes of bricks.	Understand
CO2	Understand about different brick bonds.	Understand
CO3	Identify the ages of different trees and its functioning.	Knowledge
CO4	Identify the structural components and sub-components and its functioning.	Knowledge
CO5	Know the concepts of Centering, Shuttering and Reinforcement.	Knowledge
CO6	Know the different piping systems and about adhesives.	Knowledge

Syllabus:

UNIT - I

STONES, BRICKS AND TILES

Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, aggregates-coarse & fine aggregate ,composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminum, Gypsum, Glass and Bituminous materials – their quality.

UNIT - II

MASONRY,LIME & CEMENT

Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition

walls. Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime. Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties.

UNIT – III

TIMBER & TIMBER PRODUCTS

WOOD: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber – Reinforced Plastics, Steel, Aluminium.

UNIT – IV

BUILDING COMPONENTS

Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.

UNIT - V

FINISHINGS

Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering – Paints: Constituents of paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings.

UNIT – VI

PIPES , ADHESIVES & SEALANTS

Pipes used in building construction- cast iron, plastic, GI ,stoneware , asbestos & concrete , Adhesives- Used in timber , tile fixing , Joining concrete , claddings , sealing compounds & joint fillers.

Text Books:

1. Building Materials by S.S. Bhavikatti, Vices publications House private ltd.
2. Building Construction by S.S. Bhavikatti, Vices publications House private ltd.
3. Building Materials by B.C. Punmia, Laxmi Publications private ltd.
4. Building Construction by B.C. Punmia, Laxmi Publications (p) ltd.

Reference Books:

1. Building Materials by S.K.Duggal, New Age International Publications.
2. Building Materials by P.C.Verghese, PHI learning (P) ltd.
3. Building Materials by M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction by P.C.Verghese, PHI Learning (P) Ltd.

Web Reference:

http://freevideolectures.com/Course/86/Building-Materials-and-Construction

Dr. G.V.R.Prasada Raju **Dr.D.Rama Seshu** **Dr.D.S.Murthy**

Mr.P.V.Muthyalu **Mr.B.S.Ramji** **Ms.G.Shilpa Devi**

Mr.G.S.V.Brahmaji **Mr.V.Raju** **Ms.V.N.Bandhavi**

II Year – I SEMESTER	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16CE3T02 -FLUID MECHANICS

Course Learning Objectives:

Basic concepts of fluids and fluid flow are essential in all the engineering Disciplines to get better understanding of the courses in the professional Programmes and obviously its importance as a core subject need not be over emphasized. Hence, it is mandatory to learn the fundamental concepts in the field of fluid mechanics.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Know the definitions of fundamental concepts of fluid mechanics	Understand
CO2	Identify the nature of flow in pipe and hydrostatic forces acting on submerged static fluid.	Knowledge
CO3	Calculate the pressure and velocities by using the Bernoulli's equation and momentum equation.	Apply
CO4	Compute the integral thickness, wall shear thickness and skin friction by utilizing the concepts of viscous boundary layers and momentum integral.	Apply

CO5	Estimate the head losses in a closed conduit flow interconnected with Reynolds number.	Evaluate
CO6	Justify the rate of flow through channels by using flow measurement devices.	Create

Syllabus:

UNIT I

INTRODUCTION : Dimensions and units, Physical properties of fluids, specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law- Relationship between pressures- measurement of pressure- Pressure gauges, Manometers: Differential and Micro Manometers.

UNTI – II

HYDROSTATICS: Hydrostatic forces on submerged plane-Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems.

FLUID KINEMATICS: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, Flow net; Vortex flow – free vortex and forced, vertex flow.

UNIT – III

FLUID DYNAMICS: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Navier – Stokes equations (Explanationary) Momentum equation and its application – forces on pipe bend.

UNIT – IV

BOUNDARY LAYER THEORY: Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers, no deviations BL in transition, separation of BL, Control of BL, Introduction to drag & lift.

UNIT – V

LAMINAR FLOW: Reynolds's experiment – Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

CLOSED CONDUIT FLOW: Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems, Moody's Chart.

UNIT – VI

MEASUREMENT OF FLOW: Pitot tube, Venturimeter and Orifice meter– classification of orifices, small orifice and large orifice, flow over rectangular, triangular and trapezoidal and stepped notches - Broad crested weirs. Classification of mouthpieces; Flow through external and internal cylindrical mouthpiece.

Text Books:

1. Fluid Mechanics and Hydraulic Machines by R. K. Bansal; Laxmi Publications; New Delhi.
2. Hydraulics & Fluid Mechanics by P. N. Modi & S. N. Seth; Standard Book house, New Delhi
3. Rajput R.K., Fluid Mechanics and Hydraulic Machines, S.Chand and Company Ltd., 2005.

Reference Books:

1. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi
2. K.Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill Publishing Company, 2002.
3. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd. New Delhi
4. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M.Katz and James P. Schaffer, Oxford University Press, New Delhi
5. Fluid Mechanics by Merie C. potter and David C. Wiggert, Cengage learning

Web Reference:

1. Dr. T. I. Eldho, IIT / Bombay – Fluid Mechanics www.nptel.ac.in/courses/105101082/
2. Dr. SubhashivaDutta& Dr. N. Sahoo, IIT/Guwahati – FluidMechanicswww.nptel.ac.in/courses/105103095/xc

Dr. G.V.R.Prasada Raju	**Dr.D.Rama Seshu**	**Dr.D.S.Murthy**
Mr.P.V.Muthyalu	**Mr.B.S.Ramji**	**Ms.G.Shilpa Devi**
Mr.G.S.V.Brahmaji	**Mr.V.Raju**	**Ms.V.N.Bandhavi**

II Year – I SEMESTER	L	T	P	C
	3	1	0	3

16CE3T03 -STRENGTH OF MATERIALS-I

Course Learning Objectives:

The behavior of materials and structural bodies under the action of loads is quantified through expressions. The relation between the external loads, internal strength parameters and displacements are well interconnected in this course

1. To give preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress strain behavior of materials and their governing laws. Introduce student the moduli of Elasticity and their relations.
2. To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions and to draw the diagrams of variation across the length.
3. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
4. The concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
5. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Know the preliminary concepts of Principles of Elasticity and Plasticity, Stress strain behavior of materials and their governing laws.	Understand
CO2	To impart concepts of Shear force and Bending Moment for beams for given boundary and loading conditions.	Analyze
CO3	Understand the concepts of stresses developed in the cross section by using the bending equations.	Knowledge
CO4	Get acquainted with the concept of shear stress distribution across the cross sections of the beams	Analyze

CO5	Measure the deflections in beams under various loading and support condition	Compute
CO6	Attain the concept of thin cylinders and spherical shells	Knowledge

Syllabus:

UNIT – I

SIMPLE STRESSES AND STRAINS: Elasticity and plasticity – Types of stresses and strains – Hooke'slaw – stress – strain diagram for mild steel – Working stress – Factor of safety – strain energy- gradual &sudden loads,Lateral strain, Poisson's ratio and volumetric strain – Elastic modules and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

UNIT – II

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Typesof 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, uniformly distributed load., uniformly varying loads and combination of these loads– Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

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

UNIT –IV

SHEAR STRESSES: Derivation of formula – Shear stress distributionacross various beam sections like rectangular, circular, triangular, I, T angle sections, built up beams, shear centre for Channel Sections and I-Sections.

UNIT – V

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflectionand radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. Uniformly varying load.-Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT – VI

THIN CYLINDERS: Thin seamless cylindrical shells –Derivation of formula for longitudinal

and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.

Text Books:

1. Strength of Materials by S. S. Bhavakatti
2. Strength of materials by R.K.Bansal vol 1 & 2

Reference Books:

1. Strength of Materials by S.S. Rattan, Tata McGraw Hill Education Pvt., Ltd.
2. Strength of materials by R.K. Rajput, S. Chand & Co, New Delhi.
3. Strength of Materials by S.Ramamrutham Dhanpat Rai Publishing Co., (P) Ltd. New Delhi
4. Theory of Structures by S.P.Timoshenko & DH. Young.

Web References:

NPTEL http://nptel.ac.in/courses/105105108/1

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II Year – I SEMESTER

L	T	P	C
3	1	0	3

16CE3T04 -SURVEYING

Course Learning Objectives:

To introduce the students to basic principles of surveying, various methods of linear and angles measuring instruments and enable the students to use surveying equipments.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Know the fundamentals in chain and plain table surveying.	Knowledge
CO2	Identify the angles on filed by compass survey.	Analyze
CO3	Apply knowledge of leveling in surveying	Application
CO4	Sketch and Measure the horizontal and vertical angles of theodolite and tachometric instruments	Application
CO5	Know the concept of Total Station and GPS modern techniques	Knowledge
CO6	Estimate volume and area of filed problems in surveying.	Understand

Syllabus:

UNIT – I

INTRODUCTION: definition-Uses of surveying, Objectives, Principles and classifications – Errors in survey measurements.

DISTANCE MEASUREMENT CONVENTIONS ANDMETHODS: Use of chain and tape,Errors and corrections to linear measurements, overview of plane table surveying.

UNIT – II

COMPASS SURVEY: compass survey - Meridians, Azimuths and Bearings, declination, computation of angle. Traversing - Purpose-types of traverse-traverse computation - traverse adjustments - omitted measurements.

UNIT – III

LEVELING AND CONTOURING: Concept and Terminology, LevellingInstruments and their Temporary and permanent adjustments- method of levelling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

UNIT – IV

THEODOLITE: Theodolite, description, principles-uses and adjustments –temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite - Trigonometrical leveling.

TACHEOMETRIC SURVEYING: Stadia and tangential methods ofTachometry. Distance and Elevation formulae for Staff vertical position.

UNIT – V

CURVES: Types of curves, design and setting out – simple and compoundcurves- transition curves. Introduction to geodetic surveying, Total Station and Global positioning system.

UNIT – VI

COMPUTATION OF AREAS AND VOLUMES: Area from field notes,computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

Text Books:

1. Surveying (Vol No.1, 2 &3) by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd, New Delhi.
2. Advance Surveying by Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
3. Text book of Surveying by C. Venkataramaiah, University press, India (P) limited.
4. Surveying and levelling by R. Subramanian, Oxford University press.

Reference Books:

1. Text book of Surveying by S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Text book of Surveying by Arora (Vol No. 1&2), Standard Book House, Delhi.
3. Higher Surveying by A.M. Chandra, New Age International Pvt Ltd.
4. Fundamentals of surveying by S.K. Roy – PHI learning (P) Ltd.
5. Plane Surveying by Alak de, S. Chand & Company, New Delhi.

Web Reference:

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II Year – I SEMESTER

L	**T**	**P**	**C**
0	**0**	**3**	**2**

16CE3L01 -STRENGTH OF MATERIALS LAB

List of Experiments:

1. Tension test on Mild Steel bar.
2. Bending test on (Steel / Wood) Cantilever beam.

3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – deflection test.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Know practical knowledge of stress strain relationship	Knowledge
CO2	Get acquainted with deflections and flexural behavior of different beams	Knowledge
CO3	Attain the practical knowledge of torsional behavior of specimen	knowledge
CO4	Get acquainted with various material properties	knowledge
CO5	Get acquainted with various moduli	knowledge
CO6	Student will attain the practical knowledge of compressive nature of specimen	knowledge

List of Major Equipment:

1. UTM for conducting tension test on rods
2. Steel beam for flexure test
3. Wooden beam for flexure test
4. Torsion testing machine
5. Brinnell's / Rock well's hardness testing machine
6. Setup for spring tests
7. Compression testing machine
8. Izod Impact machine
9. Shear testing machine
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup

12. Electrical Resistance gauges.

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II Year – I SEMESTER

L	**T**	**P**	**C**
0	**0**	**3**	**2**

16CE3L02 -SURVEYING FIELD WORK-I

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Compute the road widening by chain survey	Create
CO2	Survey the given area by compass	Analyze
CO3	Sketch the given area by plane table	Application
CO4	Prepare maps for given land by plane table	Create
CO5	Differentiate various levels for specified area	Understand
CO6	Design given road profile by auto level	Create

List of Field Works:

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit).
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse).
5. Plane table survey: finding the area of a given boundary by the method of Radiation.
6. Plane table survey: finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling: Height of the instrument method (differential levelling).
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling: Longitudinal Section and Cross sections of a given road profile.

Note: Any 10 field work assignments must be completed.

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II Year – II SEMESTER

L	T	P	C
3	1	0	3

16CE4T05 -BUILDING PLANNING & DRAWING

Course Learning Objectives:

1. To understand the principles of planning & bylaws.
2. To draw plan, elevation and section of public and industrial structures.
3. To prepare detailed working drawing for doors, windows, etc.

Course Outcomes:

1. Explain various building bye-Laws laid by town planning authorities and local regulatory bodies
2. Apply techniques for effective project planning and management
3. Plan the different types of residential buildings based on the minimum requirements
4. Plan various public buildings like educational, office buildings and hospital buildings
5. Develop the building drawing as per standards in various phases of a project
6. Outline the detailing in building construction

Syllabus:

UNIT- I
BUILDING BYELAWS AND REGULATIONS
Introduction- terminology- objectives of building byelaws- floor area ratio-floor space index-principles under laying building bye laws- classification of buildings- Floor Area Ratio (FAR). Floor Space Index (FSI).Open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements- Principles of Vaasthu in building planning.

UNIT - II
RESIDENTIAL BUILDINGS
Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types' residential buildings.

UNIT - III
PUBLIC BUILDINGS
Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.Requirements and Minimum Standards for Residential Buildings- Requirements and Minimum Standards for various Public Buildings.

UNIT - IV
SIGN CONVENTIONS AND BONDS
Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles.English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

UNIT - V
DOORS, WINDOWS, VENTILATORS AND ROOFS
Panelled door, panelled and glassed door, glassed windows, panelled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs.King Post truss, Queen Post trussSloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.

UNIT - VI

PLANNING AND DESIGNING OF BUILDINGS

Draw the Plan, Elevation and sections of a Residential & Public buildings from the given line diagram-staircases.

Text Books:

1. Planning and Design of buildings by Y.S. Sane
2. Planning, designing and Scheduling by Gurucharan Singh and Jagadish Singh
3. Building planning and drawing by M. Chakravarthi.
4. 3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

Reference Books:

1. Building drawing by Shah and Kale.
2. 'The Hindu Science of Architecture and Vaasthu' , D.N.Sukhla.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in three components as follows:

1.	Descriptive (subjective type) examination	: 25 marks
2.	Assignment	: 05 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consist of five questions in planning portion out of which three questions are to be answered. Part B should consist of two questions from drawing part out of which one is to be answered in drawing sheet. Weight age for Part – A is 60% and Part- B is 40%.

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II Year – II SEMESTER	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16CE4T06 -CONCRETE TECHNOLOGY

Course Learning Objectives:

- To learn the concepts of Concrete production and its behavior in various environments.
- To learn the test procedures for the determination of properties of concrete.
- To understand durability properties of concrete in various environments.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Know the basic concept of concrete and its ingredient's	knowledge
CO2	Perceive the importance of quality of concrete	understand

CO3	Test the hardened concrete properties	Create
CO4	Design the concrete mix by BIS method	Create
CO5	Understand the behavior of concrete in various environmental conditions	knowledge
CO6	Understand the Basic concept of special concrete and their production	Knowledge

Syllabus:

UNIT - I

INGREDIENTS OF CONCRETE

CEMENTS & ADMIXTURES: Portland cement – Chemical composition –Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume.

AGGREGATES: Classification of aggregate – Particle shape & texture –Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixing water.

UNIT – II

FRESH CONCRETE: Steps in Manufacture of Concrete–proportion,mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

UNIT – III

HARDENED CONCRETE: Water / Cement ratio – Abram's Law –Gel space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.

UNIT – IV

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

UNIT – V

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

UNIT – VI

SPECIAL CONCRETES: Ready mixed concrete, Shotcrete -Light weightaggregate concrete – Cellular concrete – No-fines concrete, High density concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C, Polymer concrete – Types of Polymer concrete – Properties of polymer concrete, High performance concrete – Self consolidating concrete, SIFCON, self healing concrete.

Text Books:

1. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004.
2. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.

Reference Books:

1. Properties of Concrete by A. M. Neville – PEARSON – 4th edition.
2. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi.

Web Reference:

http://freevideolectures.com/Course/3357/Concrete-Technology

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II Year – II SEMESTER	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

16CE4T07 -ENGINEERING GEOLOGY

Course Learning Objectives:

The objective of this course is:

1. To introduce the Engineering Geology as a subject in Civil Engineering.
2. The objectives of Engineering Geology are to introduce the student to geology and to the effect of geology on the design and construction of civil engineering constructed facilities. Students will learn engineering elements of rock and geologic processes from the following engineering perspective.
3. To identify the seismic hazards posed at any given site;

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Introduce the subject and give a brief explanation to civil engineering importance	knowledge
CO2	Observe and Identify the properties of rocks and minerals and to impart a brief importance in the point of identification.	identification
CO3	Know a brief knowledge About Recognize of various structures of rock	Recognization

CO4	Classify and measure the earthquake prone areas to practice the hazard Zonation. Impart a brief knowledge about landslides	knowledge
CO5	Observe various geophysical methods to identify the differences between the geology and geophysics	observe
CO6	Locate a suitable site for the costruction of civil engineering structures	**knowledge**

Syllabus:

UNIT-I

Introduction: Branches of Geology, Importance of Geology in CivilEngineering with case studies.

Weathering: Weathering of rocks, Geological agents, weathering process ofRock, River process and their development.

UNIT-II

Mineralogy And Petrology: Definitions of mineral and rock, Differentmethods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

UNIT-III

Structural Geology: Strike , Dip and Outcrop study of common geologicalstructures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

UNIT-IV

Ground Water: Water table, Cone of depression, Geological controls ofGround Water Movement, Ground Water Exploration Techniques.

Earthquakes And Land Slides: Terminology, Classification, causes andeffects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides.

UNIT-V

Geophysics: Importance of Geophysical methods, Classification, Principlesof Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity methods and Engineering properties of rocks.

UNIT-VI

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams,Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

Text Books:

1. 'Engineering Geology' by N. ChennaKesavulu, Trinity Press (Laxmi Publications), 2nd Edition, 2014.
2. 'Engineering Geology' by Subinoy Gangopadhay, Oxford University press.
3. 'Engineering Geology' by D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
4. 'Engineering Geology' by Vasudev Kanithi, University Press.

Reference Books:

1. 'Engineering Geology for Civil Engineers' by P.C. Varghese, PHI learning pvt. Ltd.
2. 'Geology for Engineers and Environmental Society' by Alan E Kehew, person publications, 3rd edition.
3. 'Fundamentals of Engineering Geology' by P.G. Bell, B.S.P. Publications, 2012.
4. 'Engineering Geology' by V.Parthesarathi et al., Wiley Publications.
5. 'Environmental Geology' by K.S. Valdiya, McGraw Hill Publications, 2nd ed.

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II Year – II SEMESTER

L	T	P	C
3	1	0	3

16CE4T08 -HYDRAULICS & HYDRAULIC MACHINERY

Course Learning Objectives:

1. To get exposure about the applications of Hydraulic Engineering in the field by means of studying the various devices, equipments and machinery.
2. To learn applications of hydraulics & hydraulic machines.
3. To study about different types of turbo machinery.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	To study theories those explain the behavior and performance of fluid when the fluid is flowing in an Uniform open channel	knowledge
CO2	To study theories those explain the behavior and performance of fluid when the fluid is flowing in an NonUniform open channel	knowledge
CO3	Student will attain the knowledge on hydraulic similitude of fluids	analyze
CO4	Student will get acquainted with the concept of impact of jets	understand
CO5	To understand the components, function and use of different types of turbines.	knowledge
CO6	To understand the components, function and use of different types of pumps	knowledge

Syllabus:

UNIT – I

OPEN CHANNEL FLOW I: Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; Kutter's Equations; and Bazin formulae for uniform flow – Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth –critical sub-critical and super critical flows.

UNIT – II

OPEN CHANNEL FLOW II: Non uniform flow-Dynamic equation forG.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles directstep method- Rapidly varied flow, Applications of hydraulic jump, energy dissipation.

UNIT – III

HYDRAULIC SIMILITUDE: Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

UNIT – IV

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.

UNIT – V

HYDRAULIC TURBINES – I: Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines, Pelton wheel - Francis turbine – Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency.

HYDRAULIC TURBINES – II: Draft tube-theory & function efficiency,Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation.

UNIT – VI

CENTRIFUGAL-PUMPS: Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies, specific speed, multistage pumps-pumps in parallel- performance of pumps Similarity Considerations. Characteristic curves - NPSH-Cavitations.

RECIPROCATING PUMPS: Introduction, classification of reciprocating pumps, main components of reciprocating pumps, working of a reciprocating pumps, discharge through pumps, indicator diagram, work done by reciprocating pumps, slip of reciprocating pumps.

Text Books:

1. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi
2. Hydraulics & Fluid Mechanics by P. N. Modi & S. N. Seth; Standard Book house, New Delhi.
3. Open Channel flow by K. Subramanya, Tata McGraw Hill Publishers

4. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal
- Laxmi Publications (P) Ltd., New Delhi

Reference Books:

1. Hydraulic Machines by Jagadhishlal; Metropoliton Company, Delhi.
2. Fluid Mechanics & Hydraulic Machines by Dr. R. K. Bansal; Laxmi Publications, New Delhi.
3. Rajput R.K., Fluid Mechanics and Hydraulic Machines, S.Chand and Company Ltd., 2005.
4. Fluid Mechanics & Fluid Power Engineering by D.S. Kumar Kataria& Sons.
5. K.Subramanya, Open Channel Flow, Tata McGraw Hill Publishing Company,2002.

Web Reference:

www.nptel.ac.in/courses/105101082/
www.nptel.ac.in/courses/105103095/xc

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II Year – II SEMESTER	L	T	P	C
	3	1	0	3

16CE4T09 -STRENGTH OF MATERIALS-II

Course Learning Objectives:

1. To give preliminary concepts of Principal stresses and strains developed in cross section of the beams analytically as well as graphically due to stresses acting on the cross section and stresses on any inclined plane.
2. To impart concepts of failures in the material considering different theories.
3. To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	The student will be able to understand the basic concepts of Principal stresses developed along different axes and design the sections and will be aware of various theories of failure	Analyze
CO2	Student will get acquainted with the concept of torsion and deflections in springs	Analyze
CO3	Student will understand the concept of short, medium and long columns	Understand
CO4	Student will be able to determine direct and bending stresses in chimneys, retaining walls and dams	Analyze
CO5	Student will be able to analyze and design thick cylinders and Spherical shells	Design
CO6	Student will be able to understand how to analyze pin jointed frames	Analyze

Syllabus:

UNIT- I

PRINCIPAL STRESSES AND STRAINS AND THEORY OF FAILURES: Introduction – Stresses on an inclined section of a bar underaxial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses Accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

THEORIES OF FAILURES: Introduction – Various Theories of failureslike Maximum Principal Stress theory – Maximum Principal Strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

UNIT – II

TORSION OF CIRCULAR SHAFTS AND SPRINGS: Theory of puretorsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

SPRINGS: Introduction – Types of springs – deflection of close and opencoiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

UNIT – III

COLUMNS AND STRUTS: Introduction – Types of columns – Short,medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula. Laterally loaded struts – subjected to uniformly distributed and concentrated loads – Maximum B.M. and stress due to transverse and lateral loading. Columns with Initial Curvatures

UNIT – IV

DIRECT AND BENDING STRESSES: Stresses under the combined actionof direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

UNIT – V

THICK CYLINDERS: Introduction Lame's theory for thick cylinders –Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.Introductionto Unsymmetrical Bending.

UNIT – VI

ANALYSIS OF PIN-JOINTED PLANE FRAMES: Determination ofForces in members of plane, pin-jointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections.

Text Books:

1. Mechanics of Materials- by R. C. Hibbler
2. Strength of materials by S. S. Bhavakatti
3. Strength of materials by R.K.Bansal vol 1 & 2

Reference Books:

1. Fundamentals of Solid Mechanics M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.
2. Introduction to text book of Strength of Material by U.C. Jindal, Galgotia publications.
3. Strength of materials by R. Subramanian, Oxford university press, New Delhi.
4. Strength of Materials by S.Ramamrutham Dhanpat Rai Publishing Co., (P) Ltd. New Delhi
5. Theory of Structures by S.P.Timoshenko & DH. Young

Web Reference:

http://nptel.ac.in/courses/105102090/
http://nptel.ac.in/courses/105106116/1

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Mr.P.V.Muthyalu	**Mr.B.S.Ramji**	**Ms.G.Shilpa Devi**
Mr.G.S.V.Brahmaji	**Mr.V.Raju**	**Ms.V.N.Bandhavi**

II Year – II SEMESTER

L	**T**	**P**	**C**
3	**1**	**0**	**3**

16CE4T10 -STRUCTURAL ANALYSIS -I

Course Learning Objectives:

1. To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
2. To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions and to draw the diagrams of variation across thelength.
3. The procedure for development of slope deflection equations and to solve application to

continuous beams with and without settlement of supports.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Able to analysis the bending moment and shear force of propeed cantilever beam at different boundary condition.	Analyzing
CO2	Determine the statically indeterminate beam with different load conditions and analysis the bending moment and shear force and deflection at sinking of supports.	Apply
CO3	Analyze the condition beam by using clapeyron's theorems at different support conditions.	Analyzing
CO4	Analysis the continuous beam by using slope deflection method.	Analyzing
CO5	Differentiate and determinate the energy theorem	Applying /Remembering
CO6	Understand the performance and to design of bridge structure in next level.	Understand

Syllabus:

UNIT – I

PROPPED CANTILEVERS: Analysis of propped cantilevers-shear forceand bending moment diagrams-Deflection of propped cantilevers.

UNIT – II

FIXED BEAMS – Introduction to statically indeterminate beams with U. D.load central point load, eccentric point load. Number of point loads, uniformly varying load, couple and combination of loads shear force and bending moment diagrams-Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT – III

CONTINUOUS BEAMS: Introduction-Clapeyron's theorem of threemoments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and Bending moment diagrams.

UNIT-IV

SLOPE-DEFLECTION METHOD: Introduction, derivation of slopedeflection equation, application to continuous beams with and without settlement of supports.

UNIT – V

ENERGY THEOREMS: Introduction to Strain energy, Strain energy in linear elastic system,expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed trusses.

UNIT – VI

MOVING LOADS and INFLUENCE LINES: Introduction maximum SFand BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.

INFLUENCE LINES: Definition of influence line for SF, Influence line forBM- load position for maximum SF at a section-Load position for maximum BM at a sections, ingle point load, and U.D.L longer than the span, U.D.L shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Text Books:

1. Structural Analysis by V.D. Prasad Galgotia publications, 2nd Editions.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.

Reference Books:

1. Theory of Structures by Gupta, Pandit & Gupta; Tata McGraw Hill, New Delhi.
2. Theory of Structures by R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi
4. Determinate &Indeterminate structures by R.C.Jindal

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Mr.G.S.V.Brahmaji	**Mr.V.Raju**	**Ms.V.N.Bandhavi**

II Year – II SEMESTER	L	T	P	C
	0	0	3	2

16CE4L03 -FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Student will attain the knowledge on various flow measuring devices	Knowledge
CO2	Student will understand the importance the friction factors in the in pipes	Knowledge
CO3	Student will attain the knowledge on impact of jets	Knowledge
CO4	Student will understand the importance of various characteristic curves of turbines	Knowledge
CO5	Student will attain the knowledge on application Bernoulli's equation	Knowledge
CO6	Student will understand the importance of various characteristic curves of pumps	Knowledge

List of Experiments

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

List of Equipment:

1. Venturimeter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.

10. Pelton wheel and Francis turbines.
11. Centrifugal and Reciprocating pumps.

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II Year – II SEMESTER

L	**T**	**P**	**C**
0	**0**	**3**	**2**

16CE4L04 -SURVEYING FIELD WORK-II

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Understand fundamentals about theodolite instrument	Knowledge
CO2	Identify the distance between two inaccessible points	Understand
CO3	Calculating vertical distance problems by tachometric principles	Analyze
CO4	Explain modern instruments in surveying	Analyze
CO5	Find errors in the field by using total station	Evaluate
CO6	Prepare drawings by doing these exercises	Create

List of Experiments

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tachometric survey: Heights and distance problems using tachometric principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station: Introduction to total station and practicing setting up, leveling up and elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station : Traversing
10. Total Station : Contouring

11. Total Station: Determination of Remote height.

12. Total Station: distance between two inaccessible points.

Note: Any 10 field work assignments must be completed.

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III Year-I Semester **L T P C**

3 1 0 3

16CE5T11 - DESIGN & DETAILING OF REINFORCED CONCRETE STRUCTURES

Course Learning Objectives:

The objective of this course is:

- The student can gain the knowledge about the behavior of reinforced concrete elements and load transferring system.
- Familiarize Students with different types of design philosophies.
- Equip student with concepts of design of flexural members.
- Understand Concepts of shear, bond and torsion.
- Familiarize students with different types of compression members and design.
- Understand different types of footings and their design.
- To gain knowledge about different types of loads on structures and different codes of practice.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Identify the methods which aresuitable for particular structures.	Understand
CO2	Carryout analysis and design of flexural members and detailing.	Analysing
CO3	Decipher concepts of shear, torsion and bond.	Understand
CO4	Design the short and long columns with desirable loading conditions.	Creating
CO5	Design the slabs with desirable loading conditions.	Creating
CO6	Determine the dimensions of the footing with desirable loading conditions.	Evaluating

SYLLABUS:

UNIT –I

Introduction: Working stress method Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly and doubly reinforced beams.

Limit State Design: Concepts of limit state design – Basic statisticalprinciples – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress – block parameters – limiting moment of Resistance.

UNIT –II

Design for Flexure: Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange –Behaviour- Analysis and Design.

UNIT – III

Design for Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

Limit state design for serviceability: Deflection, cracking and code provision, Design of formwork for beams and slabs.

UNIT – IV

Design of Compression members: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

UNIT –V

Footings: Different types of footings – Design of isolated and combined footings - rectangular and circular footings subjected to axial loads, uni-axial and bi-axial bending moments.

UNIT – VI

Slabs: Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

NOTE: All the designs to teach in Limit State Method, Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Reinforcement particulars of columns and footings.
4. Detailing of One way, Two way and continuous slabs.

INTERNAL EXAMINATION PATTERN:

The total internal marks (40) are distributed in two components as follows:

1. Descriptive (subjective type) examination: 30marks.
2. Assignment: 10 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Detailing ,out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

Text Books:

1. Reinforced concrete design by S.Unnikrishna Pillai &DevdasMenon, Tata Mc.Graw Hill, New Delhi.
2. Fundamentals of reinforced concrete by N.C. Sinha and S.K Roy, S. Chand publishers.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishres, New Delhi.
4. Limit State Design by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi.

References:

1. Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi.
2. Reinforced concrete structural elements – behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill, 1994.
3. Design of concrete structures – ArthusH.Nilson, David Darwin, and Chorles W. Dolar, Tata Mc.Graw-Hill,3rd Edition, 2005.
4. Reinforced concrete structures, Vol.1, by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt.Ltd., New Delhi.
5. Reinforced concrete structures – I.C. Syal&A.K.Goel, S.Chand Publishers.
6. Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, New Delhi.

IS Codes:

1. IS -456-2000 (Permitted to use in examination hall)
2. IS – 875 part (I, II, III, IV)
3. SP-16(Permitted to use in examination hall)

Web References:

1. http://freevideolectures.com/Course/2686/Design-of-Reinforced-Concrete-Structures

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III Year-I Semester

L	T	P	C
3	1	0	3

16CE5T12 - GEOTECHNICAL ENGINEERING - I

Course Learning Objectives:

- To enable the knowledge of availability, types and index properties of soils.
- To enunciate the concept of permeability and seepage through soils for better understanding the discharge through different types of soils.
- To impart the principles of compaction & consolidation of various soils and to determine their relevant data that is used for functional purpose.
- To make the student to understand the concept of shear strength, stresses induced and to determine various parameters.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Demonstrate how the soils are originated, transported, formed and their classification.	Understand
CO2	Apply the compaction techniques on field and its control.	apply
CO3	Applying the concept of seepage through soil to construct the flow net for water flow calculations	Analyse
CO4	Examine the stress distribution under the loads.	Apply
CO5	Measures shear strength parameters for field conditions.	Evaluation
CO6	Predict the consolidation settlements.	Creating

SYLLABUS:

UNIT – I

Introduction & Index Properties Of Soils: Soil formation – soil structure and clay mineralogy –Adsorbed water – Mass- volume relationship –Relative density – Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

UNIT – II

Compaction: Introduction-Types of compaction- Standard proctor test and modified proctor test -Mechanismof compaction – factors affecting – effects of compaction on soil properties-Compaction of clayey soil and sand-Field compaction of soils and field compaction control.

UNIT –III

Permeability: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses.

Seepage through Soils: Seepage force &seepage pressure; Types of flows and heads-Quick sand condition; Laplace equations; Characteristics of flow net; Uses of flow nets; Seepage through earth dams with horizontal filter; Uplift pressure ;gradient and piping.

UNIT – IV

Stress Distribution In Soils: Stresses induced by applied loads -Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method.

UNIT - V

Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination various drainage conditions.

UNIT - VI

Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (c_v) – Over consolidated and normally consolidated clays.

INTERNAL EXAMINATION PATTERN:

The total internal marks (40) are distributed in three components as follows:

1. Descriptive (subjective type) examination: 20marks
2. Objective examination: 10marks.
3. Assignment: 10 marks.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of six questions in definitions, principles and concepts ,all questions are to be answered. Part B should consist of six questions and out of which four are to be answered. Weightage for Part – A is 20% and Part- B is 80%.

Text Books:

1. 'Basic and Applied Soil Mechanics' by Gopal Ranjan and A.S.R.Rao, New Age International Publishers.
2. 'Soil Mechanics and Foundation Engineering' by V.N.S.Murthy, CBS publishers.
3. 'Soil Mechanics and Foundation Engineering' by Dr.K.R.Arora ,Standard publishers.

REFERENCES:

1. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley.
2. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall.
3. 'Soil Mechanics' by M.Palani Kumar, PHI Learning.
4. Soil Mechanics and Foundation Engineering by B. C. Punmia; LaxmiPublications, Delhi.
5. Relevant Indian Standard Code Books.

Web Reference:

1. http://nptel.ac.in/courses/105103097/

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III Year-I Semester

L	T	P	C
3	1	0	3

16CE5T13 - STRUCTURAL ANALYSIS - II

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with Different types of Structures.
- Equip student with concepts of Arches.
- Understand Concepts of lateral Load analysis.
- Familiarize Cables and Suspension Bridges.
- Understand Analysis methods Moment Distribution, Kani's Method and Matrix methods.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Differentiate Determinate and Indeterminate Structures of Arches.	Applying
CO2	Carryout lateral Load analysis of structures.	Remembering
CO3	Analyze Cable and Suspension Bridge structures.	Analyzing
CO4	Analyze structures by using Moment Distribution Method.	Analyzing
CO5	Analyze structures by using Kani's Method.	Analyzing
CO6	Analyze structures by using Matrix Methods.	Analyzing

SYLLABUS:

UNIT - I

Three Hinged Arches: Classification of arches,Elastic theory of arches – Eddy's theorem - Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature.

Two Hinged Arches: Determination of horizontal thrust, bending moment,normal thrust and radial shear – Rib shortening and temperature stresses, tied arches.

UNIT-II

Lateral Load Analysis Using Approximate Methods: application tobuilding frames.

(i) Portal method (ii) Cantilever method.

UNIT – III

Cable Structures and Suspension Bridges: Introduction, characteristics ofcable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

UNIT – IV

Moment Distribution Method: Stiffness and carry over factors –Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway-Substitute frame analysis by two cycles.

UNIT – V

Kani's Method: Analysis of continuous beams – including settlement ofsupports and single bay portal frames with and without side sway.

UNI – VI

Introduction to Matrix Methods:

Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

TEXT BOOKS:

1. 'Structural Analysis' by T.S.Thandavamoorthy, Oxford university press, India.
2. 'Structural Analysis' by R.C. Hibbeler, Pearson Education, India.
3. 'Theory of Structures – II' by B.C.Punmia, Jain & Jain, Laxmi Publications, India.
4. 'Structural Analysis' by C.S. Reddy, Tata Mc-Graw hill, New Delhi.

REFERENCES:

1. 'Intermediate Structural Analysis' by C. K. Wang, Tata McGraw Hill, India.
2. 'Theory of structures' by Ramamuratam, Dhanpatrai Publications.
3. 'Analysis of structures' by Vazrani&Ratwani – Khanna Publications.
4. 'Comprehensive Structural Analysis-Vol.I&2' by Dr. R. Vaidyanathan&Dr. P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi.

Web Reference:

1. http://nptel.ac.in/courses/105101086/

III Year-I Semester

L	T	P	C
3	1	0	3

16CE5T14- TRANSPORTATION ENGINEERING - I

Course Learning Objectives:

The objective of this course is:

- To impart different concepts in the field of Highway Engineering.
- To acquire design principles of Highway Geometrics and Pavements.
- To learn various highway construction and maintenance procedures.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Plan highway network for a given area.	Remembering
CO2	Design the Highway geometrics based on highway alignment.	Evaluation
CO3	Design Intersections and prepare traffic management plans.	Creating
CO4	Judge suitability of pavement materials and design flexible and rigid pavements	Evaluation
CO5	Characterize the pavement materials like aggregates, Bituminous materials &construction.	Understand
CO6	Determine traffic speed, volume, travel time and density.	Applying

SYLLABUS:

UNIT - I

Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT – II

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

UNIT – III

Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC method.

UNIT – IV

Highway Materials: Sub-grade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties -Tests on Bitumen

UNIT – V

Design Of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

UNIT – VI

Highway Construction and Maintenance: Types of Highway Construction– Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements. Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing

pavements.**Bituminous paving mixes:** Requirements – Marshall Method of Mix Design. Road construction in water logged areas and black cotton soils.

TEXT BOOKS:

1. 'Highway Engineering'byKhanna S.K., Justo C.E.G and Veeraragavan A, Nem Chand Bros, Roorkee.
2. 'Traffic Engineering and Transportation' Planning by Kadiyali L.R, Khanna Publishers, New Delhi.
3. 'Highway Engineering' by Srinivasa Kumar R, Universities Press, Hyderabad.

REFERENCES:

1. 'Transportation Engineering and Planning' by Papacostas C.S. and PD Prevedouros, Prentice Hall of India Pvt. Ltd; New Delhi.
2. 'Principles of Highway Engineering' by Kadiyali LR, Khanna Publishers, New Delhi.
3. 'Transportation Engineering - An Introduction' byJotinKhisty C, Prentice Hall, Englewood Cliffs,New Jersey.
4. 'Highway Engineering' by Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi .
5. 'Principles of Transportation Engineering' by ParthaChakroborthy and Animesh Das, PHI Learning Private Limited, Delhi
6. 'Practice and Design of Highway Engineering' by Sharma SK, Principles, S.Chand& Company Private Limited, New Delhi.
7. 'Traffic Engineering' by Mc Shane, WR and RP Roess, Prentice Hall.

Web Reference:

1. http://nptel.ac.in/courses/105101087/
2. http://nptel.ac.in/courses/105104098/
3. http://nptel.ac.in/courses/105101008/

E-Journals: Process-Functional Model of Transportation Mix Concrete
http://file.scirp.org/pdf/JTTs_2014042916230601.pdf

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III Year-I Semester

L	T	P	C
0	0	3	2

16CE5L05 - CONCRETE TECHNOLOGY LAB

Course Learning Objectives:

- To impart the various testing methods to determine the basic properties of concrete ingredients.
- To learn various fresh and hardenedproperties of concrete.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Perform the mix designs, casting the cubes and cylinders.	Creating
CO2	Summarize the concept of workability and testing of concrete.	Understand
CO3	Assess the properties of concrete ingredients.	Evaluation
CO4	Outline the importance of testing of cement and its properties.	Understand
CO5	Understand the separation of different sizes of aggregates.	Understand
CO6	Determine the bulking of sand.	Evaluation

List of Experiments:

At least 10 experiments must be conducted (at least one for each property).

1. Determination of normal Consistency and fineness of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of specific gravity and soundness of cement.
4. Determination of compressive strength of cement.
5. Determination of grading and fineness modulus of coarse aggregate by sieve analysis.
6. Determination of specific gravity of coarse aggregate.
7. Determination of grading and fineness modulus of fine aggregate (sand) bysieve analysis.
8. Determination of bulking of sand.
9. Determination of workability of concrete by compaction factor method.
10. Determination of workability of concrete by slumptest.
11. Determination of workability of concrete by Vee-beetest.
12. Determination of compressive strength of concrete and its young's modulus.

13. Non-Destructive testing on concrete (for demonstration).

List of Equipment:

1. Standard set of sieves for coarse aggregate and fine aggregate
2. Vicat's apparatus.
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus.
6. Compaction Factor Test Apparatus.
7. Vee- Bee test apparatus
8. Universal testing Machine (UTM) / Compression Testing Machine (CTM).

Text Books:

1. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004.
2. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.

Reference Books:

1. Properties of Concrete by A. M. Neville – PEARSON – 4th edition.
2. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi.

Web Reference:

http://freevideolectures.com/Course/3357/Concrete-Technology

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III Year-I Semester

L	T	P	C
0	0	3	2

16CE5L06 - ENGINEERING GEOLOGY LAB

Course Learning Objectives:

The objective of this course is:

- To identify the mega-scopic types of Ore minerals & Rock forming minerals.
- To identify the mega-scopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Identify the minerals and their properties.	Knowledge
CO2	Recognize the rocks and their properties.	Identify
CO3	Determine the behavior of the bedding planes in terms of solving strike and dip.	Applying
CO4	Draw sections for geological maps showing tilted beds.	Understand
CO5	Draw sections for geological maps showing fault beds.	Understand
CO6	Identify the morphological and geological characteristics on maps.	Knowledge

List of Experiments:

1. Physical properties of minerals: Mega-scopic identification of
2. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
3. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite.
4. Megascopic description and identification of rocks.
5. Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc…
6. Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc…
7. Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite &Biotiteschist, Marble, Khondalite, etc…

8. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
9. Simple Structural Geology problems.
10. Bore hole data.
11. Strength of the rock using laboratory tests.
12. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

Text Books:

1. 'Engineering Geology' by N. ChennaKesavulu, Trinity Press (Laxmi Publications), 2nd Edition, 2014.
2. 'Engineering Geology' by SubinoyGangopadhay, Oxford University press.
3. 'Engineering Geology' by D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
4. 'Engineering Geology' by VasudevKanithi, University Press.

Reference Books:

1. 'Engineering Geology for Civil Engineers' by P.C. Varghese, PHI learning pvt. Ltd.
2. 'Geology for Engineers and Environmental Society' by Alan E Kehew, person publications, 3rd edition.
3. 'Fundamentals of Engineering Geology' by P.G. Bell, B.S.P. Publications, 2012.
4. 'Engineering Geology' by V.Parthesarathi et al., Wiley Publications.
5. 'Environmental Geology' by K.S. Valdiya, McGraw Hill Publications, 2nded.

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III Year - I Semester **L T P C**

0 0 3 2

16CE5L07 - GEOTECHNICAL ENGINEERING LAB

Course Learning Objectives:

The objective of this course is:

- To impart knowledge of determination of index properties required for classification of soils.
- To teach how to determine compaction characteristics and consolidation behaviour from relevant lab tests; to determine permeability of soils.
- To teach how to determine shear parameters of soil through different laboratory tests.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Determine the dry density of field and OMC.	Evaluation
CO2	Examining the rate of Permeability of soil.	Analyzing
CO3	To know the type of soil excised in field.	Understand
CO4	Determine the specific gravity of soils.	Evaluation
CO5	Know the thickness of Pavement based on CBR Test.	Understand
CO6	Evaluate the shear strength parameters from field and laboratory.	Creating

List of Experiments:

1. Determination of soil Moisture Content.
2. Determination of soil Specific gravity, G.
3. Determination of soil Atterberg's Limits.
4. Determination of Field density-Core cutter and Sand replacement methods.
5. Determination of soil Grain size analysis by sieving.
6. Determination of Permeability of soil - Constant and Variable head tests.
7. Determination of dry density and OMC by using Compaction test.
8. Determination of coefficient of consolidation.
9. Determination of Shear strength parameters by using tri-axial,Vane Shear test and box shear test.
10. Determination of CBR Value.

Additional Experiments:

1. Determination of soil Differential free swells (DFS).
2. Determine the percentage of fineness soil by usingHydrometer Analysis Test.

List of Major Equipment:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits.
3. Field density apparatus for
   i) Core cutter method.
   ii) Sand replacement method.
4. Set of sieves: 4.75 mm, 2 mm, 1 mm, 0.6 mm, 0.425 mm, 0.3 mm, 0.15 mm, and 0.075 mm.
5. Hydrometer.
6. Permeability apparatus for
   i) Constant head test.
   ii) Variable head test.
7. Apparatus for Compaction test.
8. Apparatus for Consolidation test.
9. Apparatus for CBR test.
10. Box shear test apparatus.
11. Laboratory vane shear apparatus.
12. Hot air oven

Reference:

1. 'Determination of Soil Properties' by J. E. Bowles.
2. IS Code 2720 – relevant parts.

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

3 1 0 3

16CE6T15 - ENVIRONMENTAL ENGINEERING-I

Course Learning Objectives:

The course will address the following:

- Outline planning and the design of water supply systems for a community/town/city.
- Provide knowledge of water quality requirement for domestic usage.
- Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
- Selection of valves and fixture in water distribution systems.
- Impart knowledge on design of water distribution network.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	List the properties of raw water and waste water.	Remembering
CO2	Identify the water source, treatment and supply.	Applying
CO3	Adopt a water treatment facilities in water supply	Creating
CO4	Demonstrate the physical, chemical and biological unit operations in treatment analysis.	Analysis
CO5	Demonstrate the disinfection and other miscellaneous treatment process.	Analysis
CO6	Plan and design the water distribution networks as per the requirements.	Creating

SYLLABUS:

UNIT–I

Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Objectives of protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations-factors affecting water demand, Design Period, Factors affecting the Design period, Population forecasting studies.

UNIT-II

Sources of Water: Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass

curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

Collection and Conveyance of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, laying of pipe lines.

UNIT-III

Quality and Analysis of Water: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water.

UNIT–IV

Treatment of Water: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Maintenance of treatment units.

UNIT-V

Disinfection and softening of water: Theory of disinfection-Chlorination and other Disinfection methods, kinetics, disinfection , Softening of Water, Removal of color and odours - Iron and manganese removal –Adsorption-fluoridation and deflouridation–aeration– Reverse Osmosis-Iron exchange–Ultra filtration.

UNIT–VI

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods-Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, and water meters–Laying and testing of pipe lines- selection of pipe materials, pipe joints.

Text Books:

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
2. Civil Engineering Elements of Environmental Engineering – K.N. Duggal, S. Chand &Company Ltd., New Delhi, 2012.

References:

1. Water Supply Engineering – Dr. P.N. Modi
2. Water Supply Engineering – B.C. Punmia
3. Water Supply and Sanitary Engineering – G.S.Birdie and J.S. Birdie

4. Environmental Engineering by D. Srinivasan, PHI Learning Private.

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III Year-II Semester

L	T	P	C
3	1	0	3

16CE6T16 - GEOTECHNICAL ENGINEERING-II

Course Learning Objectives:

- To enable the knowledge of shallow foundation and their bearing capacities.
- To enunciate the principles involved in various field tests.
- To impart the concept of pile foundations and bearing capacities.
- To make the student to understand the concept of settlements.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Examine the soil strata by conducting the soil exploration.	Create
CO2	Determine the earth pressures on foundations and retaining structures	Evaluating
CO3	Identify the important parameters for design of foundations.	Applying
CO4	Know the suitable foundations for structures and its bearing capacity.	Understanding
CO5	Locate the places of application of theoretical and laboratory knowledge in the field.	Remembering
CO6	Estimate the settlements and determine their magnitude	Evaluating

SYLLABUS:

UNIT – I

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test-Pressure meter –planning of Programme and preparation of soil investigation report.

UNIT – II

Earth and Earth-Retaining Structures: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments –different conditions. Rankine's& Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

UNIT-III

Shallow Foundations – Bearing Capacity Criteria: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity

– factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory – IS Methods.

UNIT-IV

Shallow Foundations – Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT -V

Pile Foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays.

UNIT-VI

Well Foundations: Types – Different shapes of well – Components of well– functions – forces acting on well foundations - Design Criteria –Determination of staining thickness and plug - construction and Sinking of wells – Tilt and shift.

Text Books:

1. 'Principles of Foundation Engineering' by Das, B.M., - (2011) –6th edition (Indian edition) Cengage learning.
2. 'Basic and Applied Soil Mechanics' by GopalRanjan& ASR Rao,New Age International Pvt. Ltd, (2004).

References:

1. Foundation Analysis and Design'by Bowles, J.E., (1988) – 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. 'Theory and Practice of Foundation Design' by N.N.SOM & S.C.DAS PHI Learning Private limited.
3. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley.
4. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall.
5. 'Soil Mechanics' by M.Palani Kumar, PHI Learning.
6. Soil Mechanics and Foundation Engineering by B. C. Punmia; LaxmiPublications,Delhi.
7. Relevant Indian Standard Code Books.

Web Reference:

1. http://nptel.ac.in/courses/105103097/
2. http://www.nptelvideos.in/2012/11/foundation-engineering.html

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III Year-II Semester

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16CE6T17 - TRANSPORTATION ENGINEERING – II

Course Learning Objectives:

The objective of this course is to study different modes of transport:

- To know various components and their functions in a railway track.
- To acquire design principles of geometrics in a railway track.
- To know various techniques for the effective movement of trains.
- To acquire design principles of airport geometrics and pavements.
- To know the planning, construction and maintenance of Docks and Harbours.
- To know about the fundamental of airways.
- To know about the different fundamental components of harbour and docks.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Define good transportation network	Remembering
CO2	Design geometrics in a railway track	Create
CO3	Acquire the techniques for the effective movement oftrains	Understand
CO4	Design geometrics of runway and taxiway by Adapting Airport engineering terminology, basics and buildsknowledge	Creating
CO5	Design Runway Based on terrain.	Creating
CO6	Plan, construct and maintain Docks and Harbours	Analyse

SYLLABUS:

A.RAILWAY ENGINEERING

UNIT – I

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

UNIT – II

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

UNIT – III

Turnouts &Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B.AIRPORT ENGINEERING

UNIT – IV

Air Transportation system: Development of air transportation system with particular reference to India; Aero plane components; Air–craft characteristics. Airport Planning &Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT – V

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

C.D OCKS & HARBOURS

UNIT – VI

Water Transportation:

Types of water transportation; advantages and disadvantages of water transportation. Planning, Layout, Construction & Maintenance Of Docks &Harbours: Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Fender systems .Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.

Text Books:

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi.
2. Airport Engineering by Khanna&Arora - Nemchand Bros, New Delhi Civil Engineering.
3. Docks and Harbour EngineeringbyBindra S.P. - DhanpathiRai& Sons, New Delhi.
4. S. C. Rangawala, Railway Engineering, 25th Ed., Charotar Publishing House Pvt. Ltd., 2015.
5. Airport Engineering by G.V.Rao; Tata McGraw Hill, New Delhi.

References:

1. 'Railway Engineering'bySaxena&Arora - DhanpatRai, New Delhi.
2. 'Transportation Engineering Planning Design' by Wright P.H. &Ashfort N.J. - John Wiley & Sons.
3. 'Airport Engineering' by Virendra Kumar, DhanpatRai Publishers, New Delhi.
4. 'Transportation Engineering' by Srinivasa Kumar R, University Press, Hyderabad.
5. 'Highway, Railway, Airport and Harbour Engineering' by Subramanian KP, Scitech Publications (India) Pvt.Limited,Chennai.
6. S. C. Rangawala, Railway Engineering, 25th Ed., Charotar Publishing House Pvt. Ltd., 2015.
7. Airport Engineering by G.V.Rao; Tata McGraw Hill, New Delhi.

Web Reference:

- http://nptel.ac.in/courses/105107123/

III Year-II Semester

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3	1	0	3

16CE6T18 - WATER RESOURCE ENGINEERING -I

Course Learning Objectives:

The course is designed to:

- Introduce hydrologic cycle and its relevance to Civil engineering.
- Make the students understand physical processes in hydrology and, components of the hydrologic cycle.
- Appreciate concepts and theory of physical processes and interactions.
- Learn measurement and estimation of the components hydrologic cycle.
- Provide an overview and understanding of Unit Hydrograph theory and its analysis.
- Understand flood frequency analysis, design flood, flood routing.
- Appreciate the concepts of groundwater movement and well hydraulics.
- Learn overview of flood routing and its effects.
- Has to be understood and identify the flood occurring areas nearby.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Simplify the theories and principles governing the hydrologic processes	Analysing
CO2	Understand the forms of precipitation in real conditions	Understanding
CO3	Apply key concepts to several practical areas of engineering hydrology and related design aspects.	Creating
CO4	Estimate flood magnitude and carry out flood routing	Evaluating
CO5	Demonstrate the recuperation test process in open wells	Understanding
CO6	Design major hydrologic components for a need based structures	Creating

SYLLABUS:

UNIT - I

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. Precipitation: Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data,

frequency of point rainfall, Rain fall data in India. Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm, problems on average rainfall on towns.

UNIT- II

Abstractions from Precipitation: Introduction, Initial abstractions. Evaporation: factors affecting, measurement, reduction, Analytical methods of Evaporation estimation. Evapotranspiration: factors affecting, measurement, control, potential Evapotranspiration over India.

Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices. Problems on ϕ index and w-index.

UNIT-III

Runoff: Catchment characteristics, Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph. Problems on unit hydrograph.

UNIT-IV

Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management, Design flood, Design storm.

Flood Routing: Hydrologic storage routing, channel and reservoir routing- Muskingum and Puls methods of routing, flood control in India

UNIT-V

Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, specific capacity, permeability, transmissivity and storage coefficient, types of wells, well loss, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

UNIT - VI

Advanced Topics in Hydrology: Rainfall-runoff Modelling, instantaneous unit hydrograph (IUH) - conceptual models - Clark and Nash models, general hydrological models- Chow - Kulandaiswamy model.

Text Books:

1. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt. Ltd, (2013), New Delhi.
2. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi.
3. 'Applied hydrology'by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt.LtTransportation Engineering-Id., (2011), New Delhi.
4. 'Engineering Hydrology'byOjha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press, (2010).

References:

1. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2. 'Hydrology' by Raghunath. H.M., New Age International Publishers, (2010).
3. 'Engineering Hydrology –Principles and Practice' by Ponce V.M., Prentice Hall International, (1994).
4. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

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III Year-II Semester

L	T	P	C
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16CE6E01 - WASTE WATER MANAGEMENT

(OPEN ELECTIVE)

Course Learning Objectives:

The course will address the following:

- Enables the student to distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
- To impart knowledge on selection of treatment methods for industrial waste water.
- To know the common methods of treatment in different industries.
- To acquire knowledge on operational problems of common effluent treatment plant.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Analyse the industrial waste quantity and quality requirements.	Analyse
CO2	Identify the treatment methods for industrial wastewater	Applying
CO3	Know the basic theories of industrial waste water management.	Remembering
CO4	Decide the need of common effluent treatment plant for the industrial area in their vicinity	Evaluating
CO5	Examine the effects and treatment methods of liquid waste from the manufacturing industries	Apply
CO6	Examine the effects and treatment methods of liquid waste from the food industries.	Apply

SYLLABUS:

UNIT – I

Industrial water Quantity and Quality requirements: Boiler and cooling waters–Process water for Textiles, Food processing, Brewery Industries, power plants, fertilizers, sugar mills.

UNIT – II

Miscellaneous Treatment: Use of Municipal wastewater in Industries – Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour.

UNIT – III

Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis - Civil Engineering Wastewater characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-Volume and Strength reduction – Neutralization – Equalization and proportioning-recycling, reuse and resources recovery.

UNIT – IV

Industrial wastewater disposal management: discharges into Streams, Lakes and oceans and associated problems, Land treatment – Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastes- Effluent Disposal Method.

UNIT – V

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants.

UNIT – VI

Process and Treatment of specific Industries-2: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Pharmaceutical Plants.

Text book:

1. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi.
2. Industrial Wastewater Treatment by KVSG Murali Krishna.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning, Delhi.
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rd Edition.

References:

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, Third Edition.
2. Wastewater Engineering by Metcalf and Eddy Inc., Tata Mc- Grawhill Co., New Delhi.
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia& R.A. Christian, Prentice Hall of India.
4. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard, Cengage Learning.

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III Year-II Semester

L	T	P	C
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16CE6E02 - FUNDAMENTALS OF LIQUEFIED NATURAL GAS
(OPEN ELECTIVE)

Learning Objectives:

The course introduces the student different processes, transportation and storage of liquefied Natural gas (LNG). The students will be able to:

- Gain basic knowledge of LNG and its prospective.
- Learn different liquefaction technologies of LNG.
- Gain knowledge on different functional units on receiving terminals
- Study marine transportation of LNG and its re-gasification at the terminals.
- Understand HSE procedures employed in LNG industry.

Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Outline of LNG industry	Knowledge
CO2	Design a plant for liquefaction of natural gas safety.	Synthesis
CO3	Use the supporting units in LNG plants	Application
CO4	Explain the main components of LNG plants	Comprehension
CO5	Explain types of industries related to LNG	Comprehension
CO6	Memorise the safety , security and environmental issues in LNG plants	Knowledge

SYLLABUS:

UNIT- I

Introduction: Overview of LNG industry: History of LNG industry – Base load LNG – Developing an LNG Project – World and Indian Scenario – Properties of LNG.

UNIT- II

Liquefaction Technologies: Propane precooled mixed refrigerant process – Description of Air products C3MR LNG process – Liquefaction – LNG flash and storage. Cascade process: Description of Conoco-Phillips optimized cascade process – Liquefaction – LNG flash and storage. Other Liquefaction Processes: Description of Linde MFC LNG process- Precooling and Liquefied Petroleum Gas (LPG) recovery – Liquefaction and sub cooling- Trends in LNG train capacity – strategy for grassroots plant- offshore LNG production.

UNIT- III

Supporting Functional Units in LNG Plants: Gas pre-treatment: Slug catcher – NGL stabilization column – Acid gas removal unit – Molecular sieve dehydrating unit – Mercury and sulphur removal unit – NGL recovery – Nitrogen rejection – Helium recovery.

UNIT- IV

Receiving Terminals: Receiving terminals in India – Main components and description of marine facilities – storage capacity – Process descriptions. Integration with adjacent facilities – Gas inter changeability – Nitrogen injection – Extraction of C2+ components.

UNIT- V

LNG Shipping Industry & Major Equipment in LNG Industry: LNG Shipping Industry: LNG fleet – Types of LNG ships – Moss – Membrane – prismatic; Cargo measurement and calculations. Major equipment in LNG industry – Cryogenic heat exchangers: Spiral – Wound heat exchangers – Plate-fin heat exchangers – Cold boxes; Centrifugal compressors – Axial compressors – Reciprocating compressers. LNG pumps and liquid expanders – Loading Arms and gas turbines.

UNIT- VI

Vaporizers: Submerged combustion vaporizers- Open rack vaporizers – Shell and tube vaporizers: direct heating with seawater, and indirect heating with seawater. Ambient air vaporizers: Direct heating with ambient air – Indirect heating with ambient air. LNG tanks. Safety, Security and Environmental Issues: Safety design of LNG facilities – Security issues for the LNG industry – Environmental issues – Risk based analysis of an LNG plant.

Text Book:

1. LNG: Basics of Liquified Natural Gas, I Edition, Stanley Huang, Hwa Chiu and Doug Elliot, PETEX, 2007.

Reference Books:

1. Marine Transportation of LNG (Liquefied) and related products, Richard G. Wooler, Gornell Marine Press, 1975.
2. Marine Transportation of Liquefied Natural Gas, Robert P Curt, Timothy D. Delaney, National Maritime Research Centre, 1973.
3. Natural Gas by Sea: The Development of a New Technology, Roger Rooks, Wither by, 1993.

Web Reference:

1. https://ceonline.austin.utexas.edu/petexonline/file.php/1/ebook_demos/lng/HTML/index

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III Year-II Semester

L	T	P	C
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16CE6E03 - GREEN FUEL TECHNOLOGY

(OPEN ELECTIVE)

Learning Objectives:

The students will be imparted the knowledge of:

- Various green fuel technologies available worldwide.
- Production of Bio-ethanol from crops, molasses and cellulosic bio mass.
- Production of Bio-diesel from plant seeds, algae, and by utilizing supercritical process.
- Methane gas production utilizing bio digesters.

Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Understand about the biomass to liquids and gaseous fuels	Understand
CO2	Produce the bio ethanol chemical from crops.	Creative
CO3	Examine the bio ethanol chemical from lingo cellulosic bio mass.	Apply
CO4	Understand the bio diesel production technologies.	Understand
CO5	Experimental tests on biodiesel for the production of plant seed oils.	Apply
CO6	Know the concept of bio degrade and bio gas technologies in India.	Remembering

SYLLABUS:

UNIT- I

Introduction: Plant based biofuels- World biofuels scenario- Thermochemical conversion of biomass to liquids and gaseous fuels.

UNIT- II

Bioethanol from crops – Cane sugar: Production of ethanol from molasses – Bioethanol from starchy biomass: Production of starch Saccharifying enzymes – Hydrolysis and fermentation.

UNIT- III Bioethanol from lignocellulosic biomass: Pre-treatment of the substrates- Production of Cellulases and Hemicellulases- Hydrolysis and fermentation.

UNIT- IV

Biodiesel production technologies and substrates– Lipase-catalyzed preparation of biodiesel- Biodiesel production with supercritical fluid technologies; Biodiesel from algae: Alga culture -Challenges- Alga culture for biodiesel production.

UNIT- V

Biodiesel from different plant seeds: Palm oil diesel production and its experimental test on a diesel engine – Biodiesel production using karanja (pongamiapinnata) and jatropha (jatrophacurcas) seed oil – Biodiesel production form rubber seed oil and other vegetable oils.

UNIT- VI

Microbial production of methane: Different types of bio-digesters and biogas technology in India.

Text Books:

1. Hand book of Plant Based Biofuels, Ashok Pandey, CRC Press, 2009.

Reference Books:

1. Biofuels Engineering Process Technology, Caye M. Drapcho, Nghiem PhuNhuan, Terry H. Walker, McGraw-Hill, 2008.

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III Year-II Semester

L	T	P	C
0	0	3	2

16CE6L08 - ENVIRONMENTAL ENGINEERING LAB

Course Learning Objectives:

The course will address the following:

- Estimation some important characteristics of water and wastewater in the laboratory.
- It also gives the significance of the characteristics of the water and wastewater.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Demonstrate how to perform relevant tests in the laboratory to determine the major characteristics of water and waste water	Apply
CO2	Make use of various equipment's and methods available for examining water and waste water.	Apply
CO3	Determine the characteristics of water and waste water	Evaluating
CO4	Perform the dosage of coagulants added in raw water	Apply
CO5	Know the contents of pollutants present in raw waste water	Understanding
CO6	Estimation of the strength of the sewage in terms of BOD and COD	Evaluating

SYLLABUS:

List of Experiments:

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides in water and soil.
5. Determination and Estimation of total solids, organic solids and inorganic solids and settle able solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter &Wrinklers Method.
8. Determination of N, P, K values in solid waste.
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.

13. Presumptive Coliform test.

NOTE: At least 10 of the above experiments are to be conducted.

List of Equipment's:

1. pH meter
2. Turbidity meter
3. Conductivity meter
4. Hot air oven
5. Muffle furnace
6. Dissolved Oxygen meter
7. U–V visible spectrophotometer
8. COD Reflux Apparatus
9. Jar Test Apparatus
10. BOD incubator
11. Autoclave
12. Laminar flow chamber
13. Hazen's Apparatus

Text Books:

1. Standard Methods for Analysis of Water and Waste Water – APHA.

2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi.

Reference:

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

III Year-II Semester

L	T	P	C
0	0	3	2

16CE6L09 - TRANSPORTATION ENGINEERING LAB

Course Learning Objectives:

The objective of this course is:

- To study the properties and judge the suitability of the road materials.
- To study the properties and stability requirements of the Bitumen mixes.
- To carry out surveys for traffic volume, speed and parking.

Course outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcomes	Description	Cognitive level
CO1	Know the bitumen nature and their quality behaviour.	Remembering
CO2	Utilize aggregate and bitumen properties in pavement design.	Apply
CO3	Determine the traffic volume, speed and parking characteristics.	Applying
CO4	Judge the suitability of materials for the road construction.	Applying
CO5	Predecit the optimum bitumen content for the mix design.	Creating
CO6	Design the mix proportions of the bitumen mixes.	Creating

SYLLABUS:

1. ROAD AGGREGATES:

1. To determine the Aggregate Crushing value.
2. To determine the Aggregate Impact value.
3. To determine the specific Gravity and Water Absorption test for aggregates.
4. To conduct the Attrition Test for aggregates.
5. To conduct the Abrasion Test for aggregates.
6. To conduct the Shape tests for aggregates.

2. BITUMINOUS MATERIALS:

1. To determine the Penetration value .
2. To conduct Ductility Test.
3. To determine the Softening Point.
4. To determine the Flash and fire point.
5. To conduct Stripping Test.
6. To determine the Viscosity.

3. BITUMINOUS MIX:

1. To determine the Marshall Stability Number.

4. TRAFFIC SURVEYS:

1. To conduct Traffic volume study at mid blocks.
2. To conduct Traffic Volume Studies (Turning Movements) at intersection.
3. To conduct Spot speed studies.
4. To conduct Parking study.

5. DESIGN & DRAWING:

1. Earthwork calculations for road works.
2. Drawing of road cross sections.
3. Rotors intersection design.

REFERENCES:

8. 'Transportation Engineering and Planning' by Papacostas C.S. and PD Prevedouros, Prentice Hall of India Pvt. Ltd; New Delhi.
9. 'Principles of Highway Engineering' by Kadiyali LR, Khanna Publishers, New Delhi.
10. 'Transportation Engineering - An Introduction' byJotinKhisty C, Prentice Hall, Englewood Cliffs,New Jersey.

IV Year-I Semester

L	T	P	C
3	1	0	3

16CE7T19 - DESIGN & DETAILING OF STEEL STRUCTURES

Course Learning Objectives:

- Familiarize Students with different types of Connections and relevant IS codes.
- Equip the Student with concepts of design of flexural members, tension and compression members in trusses.
- Familiarize students with different types of Columns and column bases and their design, Plate girder and Gantry Girder and their design.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Memorize the important connections in bolting and welding as per IS code requirements.	Knowledge
CO2	Design laterally supported and unsupported beams as per IS code	Design
CO3	Design of Tension and Compression members	Design
CO4	Practice the lacing and batten members used in steel columns as compression members	Applying
CO5	Design of beam to beam, abeam to column connections.	Applying
CO6	Design of plate girder by using limit state method as per IS code recommendations.	Design

SYLLABUS:

UNIT – I

Connections: Bolted connections – definition, bolt strength and capacity, Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT – II

Beams: Design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

UNIT –III

Tension Members and compression members: General Design of members subjected to direct tension and bending –effective length of compression members. Slenderness ratio – permissible stresses. Design of compression members and struts.

Roof Trusses: Different types of trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

UNIT – IV

Design of Columns: Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns. Design of Column Foundations: Design of slab base and gusseted base. Column bases subjected moment.

UNIT- V

Design of Beam to Beam, Beam to Column Connections: Framed connections, unstiffened seat connections, stiffened seat connections.

UNIT – VI

Design of Plate Girder: Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

INTERNAL EXAMINATION PATTERN:

The total internal marks (40) are distributed in two components as follows:

- Descriptive (subjective type) examination: 30marks
- Assignment: 10 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

Text Books:

1. Design of steel structures as per Limit State Method of Design by S.S.Bavakati, International Publishing House Pvt.Ltd.
2. „Steel Structures Design and Practice“ by N.Subramanian, Oxford University Press.
3. „Limit state Design of steel structures“ by S.K. Duggal, Tata Mcgraw Hill, and New Delhi.

IS Codes:

1. IS -800 – 2007

2. IS – 875

3. Steel Tables. (These codes and steel tables are permitted to use in the examinations).

Web References:

1. http://nptel.ac.in/courses/105106112/
2. http://nptel.ac.in/courses/105106113/

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IV Year-I Semester

L	T	P	C
3	1	0	3

16CE7T20 - ENVIRONMENTAL ENGINEERING – II

Course Learning Objectives:

The objective of this course is:

- Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city.
- Provide knowledge of characterisation of wastewater generated in a community.
- Impart understanding of treatment of sewage and the need for its treatment.
- Summarize the appurtenance in sewerage systems and their necessity.
- Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems.
- Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Know the different types of sewerage systems and storm drains.	Knowledge
CO2	Understand the pumping of waste water and house plumbing.	Understand
CO3	Examine the Sewerage characteristics and treatment of sewerage.	Analysis
CO4	Demonstrate the mechanism for the removal of impurities from the sewerage systems.	Analysis
CO5	Design of septic tank and Imhoff tanks.	Creating
CO6	Analyse the available disposal options and their practical implications	Applying

SYLLABUS:

UNIT – I

Introduction to sanitation – systems of sanitation – relative merits &demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers.

UNIT – II

Pumping of wastewater: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.

House Plumbing: Systems of plumbing-sanitary fittings and other accessories–one pipe and two pipe systems – Design of building drainage.

UNIT – III

Sewage Characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD -BOD equations.

Treatment of sewage: Primary treatment-Screens-grit chambers-grease traps–floatation–sedimentation – design of preliminary and primary treatment units.

UNIT – IV

Secondary treatment: Aerobic and anaerobic treatment process-comparison.

Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons.

Attached Growth Process: Trickling Filters–mechanism of impurities removal-classification–design-operation and maintenance problems. RBCs, Fluidized bed reactors.

UNIT - V

Miscellaneous Treatment Methods: Nitrification and Denitrification – Removal of Phosphates –UASB–Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design–disposal of septic tank effluent.

UNIT – VI

Bio-solids (Sludge) management: Characteristics- handling and treatment of sludge-thickening – anaerobic digestion of sludge.

Disposal of sewage: methods of disposal – disposal into water bodies-Oxygen Sag Curve-disposal on land- sewage sickness.

Text Books:

1. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Elements of Environmental Engineering by K.N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.
3. Environmental Engineering by Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.

4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3rd Edition.

References:

1. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, by Garg, S.K.; Khanna Publishers.
2. Sewage treatment and disposal by Dr. P.N. Modi&Sethi.
3. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
4. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

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IV Year-I Semester

L	T	P	C
3	1	0	3

16CE7T21 - REMOTE SENSING & GIS APPLICATIONS

Course Learning Objectives:

The course is designed to:

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms.
- Learn concepts of visual and digital image analyses.
- Understand the principles of spatial analysis.
- Appreciate application of RS and GIS to Civil engineering.

Course outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Distinguish between the principles of photogrammetry and Remote sensing.	Analysing
CO2	To understand the different types of platforms and sensors.	Understand
CO3	Know the concept of visual and digital image analysis	Remembering
CO4	Demonstrate the fundamentals of geographic information system	Understanding
CO5	Understand the principles of spatial data analysis	Understanding
CO6	Apply the knowledge of Remote Environmental sensing in disciplines of civil engineering	Applying

SYLLABUS:

UNIT – I

Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems.

Sensors and Platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

UNIT – II

Image Analysis: Introduction, elements of visual interpretations, digital image processing-image pre-processing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT – III

Geographic Information System(GIS): Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT – IV

Spatial Data Analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

UNIT – V

RS and GIS applications General: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.

UNIT - VI

Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

Text Books:

1. Bhatta B (2008), „Remote sensing and GIS", Oxford University Press.
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) „Remote Sensing and Image Interpretation", Wiley India Pvt. Ltd., New Delhi.
3. Schowenger, R. A (2006) „Remote Sensing" Elsevier publishers.
4. „Fundamentals of Remote Sensing" by George Joseph, Universities Press, 2013.
5. „Fundamentals of Geographic Information Systems" by Demers, M.N, Wiley India Pvt. Ltd, 2013.

References:

1. „Remote Sensing and its Applications" by Narayan LRA, Universities Press, 2012.
2. „Concepts and Techniques of Geographical Information System" by Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006.
3. „Introduction to Geographic Information Systems" by KandTsung Chang, McGraw Hill Higher Education, 2009.

4. „Basics of Remote sensing & GIS“ by Kumar S, Laxmi Publications, New Delhi, 2005.
5. „Principals of Geographical Information Systems“ by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

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IV Year-I Semester

L	T	P	C
3	1	0	3

16CE7T22 - WATER RESOURCE ENGINEERING-II

Course Learning Objectives:

The course is designed to:

- Introduce the types of irrigation systems.
- Introduce the concepts of planning and design of irrigation systems.
- Discuss the relationships between soil, water and plant and their significance in planning an irrigation system.
- Understand design methods of erodible and non-erodible canals.
- Know the principles of design of hydraulic structures on permeable foundations.
- Know the concepts for analysis and design principles of storage and diversion head works.
- Learn design principles of canal structures.
- Know about the major differences between super passage and Aqua duct.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Apply the design principles of cross drainage works	Analyzing
CO2	Estimate the life of reservoir and storage capacity	Remembering
CO3	Demonstrate the behaviour of particular irrigation structures and design principles and construction features	Understanding
CO4	Design of super passage and canal regulator.	Understanding
CO5	Differentiate between the earthen dam and gravity dam.	Comprehension
CO6	Understand about river training works and interlocking system.	Understand

SYLLABUS:

UNIT- I

Irrigation: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT- II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals - Kennedy‟s silt theory and Lacey‟s regime theory, balancing depth of cutting, design of lined canal.

UNIT - III

Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. Causes and failures of weirs on permeable foundations, Bligh‟s creep theory, Khosla‟s theory, design of impervious floors for subsurface flow, exit gradient.

UNIT - IV

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

UNIT - V

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries, grouting.

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters, stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions.

UNIT - VI

Canal Structures Falls: Types and location, design principles of Sarda type fall, trapezoidal notch fall and straight glacis fall.

Regulators: Head and cross regulators, design principles.

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

Outlets: types, proportionality, sensitivity and flexibility.

River Training: Objectives and approaches, interlocking system of rivers

Text Books:

1. „Irrigation and Water Power Engineering‟ by Punmia B C,P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi.
2. „Irrigation and Water Resources Engineering‟byAsawa G L (2013), New Age International Publishers.
3. „Irrigation Engineering‟byRaghunath H.M (2012), Wiley India.
4. „Irrigation Water Resources and Water Power Engineering‟byModi P N (2011), Standard Book House, New Delhi.

References:

1. „Water Resources Engineering‟ by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi.
2. „Irrigation Engineering‟ by Sharma R.K. and Sharma, T.K (2012), S.Chand& Co Publishers.
3. „Water Resources Engineering‟bySatyanarayana Murthy Challa (2008), New Age International Publishers.
4. Concrete dams by Varshney, Oxford and IBH publishers.

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IV Year-I Semester

L	T	P	C
3	1	0	3

16CE7D01 - FINITE ELEMENT METHOD

(Elective –I)

Course Learning Objectives:

The objective of this course is:

- Equip the students with the fundamentals of Finite Element Analysis.
- Enable the students to formulate the design problems into FEA.
- Enable the students to solve Boundary value problems using FEM.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Understand the concept behind variational methods and weighted residual methods in FEM	Understand
CO2	Identify the applications and characterstics of FEA Elements of Bars, Beams, Planes and isoparametric Elements	Applying
CO3	Apply the suitable boundaryconditions to a Global stiffness Equation and reduce it to a solvable form.	Applying
CO4	Identify the FEM Expands the beyond the structural domain, For problems involving in Dynamics.	Applying
CO5	Compute Stresses and Strains and interpret the result.	Creating
CO6	Understand the concept of iso-paramatric formulation	Understand

SYLLABUS:

UNIT-I

Introduction: Review of stiffness method- Principle of Stationary potential energy-Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation.

UNIT-II

Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane stain and axi-symmetric bodies of revolution with axi symmetric loading.

UNIT-III

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix –Selection of approximate displacement functions-solution of a plane truss-transformation matrix- Galerkin‟s method for 1-D truss – Computation of stress in a truss element.

UNIT-IV

Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading.

UNIT-V

Finite element formulation for plane stress and plane strain- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces.

UNIT-VI

Iso-parametric Formulation: An iso-parametric bar element- plane bilinear iso-parametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

Text Books:

1. „A first course in the Finite Element Method‟ by Daryl L. Logan, Thomson Publications.
2. „Introduction to Finite Elements in Engineering‟ by Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.

References:

1. „Concepts and applications of Finite Element Analysis‟by Robert D. Cook, Michael E Plesha, John Wiley & sons Publications.
2. „Text book of Finite Element Analysis‟ by P. Seshu, Prentice Hall of India.

IV Year-I Semester

L	T	P	C
3	1	0	3

16CE7D02 - GROUND IMPROVEMENT TECHNIQUES

(Elective –I)

Course Learning Objectives:

- To make the student how to improving the properties of remoulded and in-situ soils by adopting different ground improvement techniques such as compaction, dewatering systems, vibration methods etc.
- To enable the students to know how reinforced soil can be used to improve the engineering properties of soils.
- To make the student understand how to stabilize the different types of poor quality soils.

Course Outcomes:

Course outcome	Description	Cognitive level
CO1	Identify the ground conditions and suggest the methods of improvement.	Knowledge
CO2	Design a reinforced earth embankment and check its stability.	Creating
CO3	Understand the concepts and applications of grouting and availability of grouting.	Understand
CO4	Identify the soil stabilisation methods for pavement construction.	Applying
CO5	Adopt the suitable techniques occurring at the low densities and cracks on pavement.	Creating
CO6	Understand the behaviour of problematic soil.	Understand

SYLLABUS:

UNIT- I

In-situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ Densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns and lime columns - thermal methods.

UNIT -II

Dewatering – sumps and interceptor ditches – single and multi-stage well points – vacuum well points – horizontal wells-foundation drains-blanket drains – criteria for choice of filler material around drains – electro osmosis.

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement –lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT- IV

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls-factors governing design of reinforced earth walls – stability checks – soil nailing.

UNIT- V

Geosynthetics – geotextiles – types – functions, properties and applications –geogrids, geomembranes and gabions - properties and applications.

UNIT-VI

Grouting – objectives of grouting – grouts, properties and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests.

Text Books:

1. „Ground Improvement Techniques"byPurushotham Raj, Laxmi Publications, New Delhi.
2. „Ground Improvement Techniques" by NiharRanjanPatro, Vikas Publishing House (P) Limited, New Delhi.

References:

1. „Ground Improvement" by MP Moseley, Blackie Academic and Professional, USA.
2. „Designing with Geosynethetics" by RM Koerner, Prentice Hall.
3. „An introduction to Soil Reinforcement and Geosynthetics" by G.L.Siva Kumar Babu, Universities Press.

Web References:

1. nptel.ac.in/courses/105104034/

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IV Year-I Semester **L T P C**

3 1 0 3

16CE7D03 - Air Pollution & Control

(Elective –I)

Course Learning Objectives:

The course will address the following:

- To know the analysis of air pollutants.
- To know the Threshold Limit Values (TLV) of various air pollutants.
- To acquire the design principles of particulate and gaseous control.
- To learn plume behaviour in different environmental conditions.
- To learn carbon credits for various day to day activities.

Course Learning Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Understand and analysis of airpollutants with climatic change and its impact.	Understand
CO2	Design principles of particulate and gaseous control measures for an industry	Create
CO3	Examine the plume behaviour in a prevailing environmental condition	Evaluation
CO4	Know the design process for gases pollutant	Create
CO5	Categorise industries with respect to site selection, zoning,legislation and emission standards.	Knowledge
CO6	Know the source of soil contamination and water quality analysis.	Knowledge

SYLLABUS:

UNIT – I

Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into µg/m3. Definition of terms related to air pollution and control, classification of air pollutants - secondary pollutants - Indoor air pollution - Climate Change and its impact -Carbon Trade.

UNIT-II

Thermodynamics and Kinetics of Air-pollution: Applications in the removal of gases like SOx, NOx, CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

UNIT – III

Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams, Plume Rise Models.

UNIT- IV

Ambient Air Quality Management: Monitoring of SPM, SO_2; NOx and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring - Weather Station. Emission Standards-Gaussian Model for Plume Dispersion.

UNIT-V

Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Cyclone separators –Fabric filters– scrubbers, Electrostatic precipitators.

UNIT – VI

Air Pollution Control Methods: Control of NOx and SOx emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

Text Books:

1. Air Pollution by M.N. Rao and H.V.N. Rao – Tata McGraw Hill Company.
2. Air Pollution and Control by KVSG Murali Krishna, Laxmi Publications, New Delhi.

Reference:

1. An Introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air pollution by Wark and Warner - Harper & Row, New York.

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IV Year-I Semester

L	T	P	C
3	1	0	3

16CE7D04 - URBAN HYDROLOGY

(Elective –I)

Course Learning Objectives:

The course is designed to:

- Appreciate the impact of urbanization on catchment hydrology
- Understand the importance of short duration rainfall runoff data for urban hydrology studies.
- Learn the techniques for peak flow estimation for storm water drainage system design.
- Understand the concepts in design of various components of urban drainage systems.
- Learn some of the best management practices in urban drainage.
- Understand the concepts of preparation master urban drainage system.

Course Outcomes:

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

Course Outcomes	Description	Cognitive Level
CO1	Develop intensity duration frequency curves for urban drainage systems.	Applying
CO2	Estimate the urban waste water in disposal system by using Particular methods	Evaluating
CO3	Design the Individual components of urban drainage systems.	Creating
CO4	Formulate for best management practices in urban drainage system.	Creating
CO5	Prepare master plan of drainage system for urbanized area.	Applying
CO6	Knowledge on urbanization and urban water system	Knowledge

SYLLABUS:

UNIT - I

Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology.

UNIT - II

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration - Frequency (IDF) curves, design storms for urban drainage systems.

UNIT - III

Approaches to urban drainage: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse, major and minor systems.

UNIT - IV

Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, and source control.

UNIT - V

Analysis and Management: Storm water drainage structures, design of storm water network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management.

UNIT - VI

Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, and use of models in planning.

Text Books:

1. „Manual on Drainage in Urbanised area“by Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, (1987 - 2 volumes), UNESCO.
2. „Urban Hydrology“ by Hall M J (1984), Elsevier Applied Science Publisher.
3. „Hydrology – Quantity and Quality Analysis“ by Wanielista M P and Eaglin (1997), Wiley and Sons.
4. „Urban Hydrology, Hydraulics and Storm water Quality: Engineering Applications and Computer Modelling“ by Akan A.O and R.L. Houghtalen (2006), Wiley International.

References:

1. „Storm water Detention for Drainage“ by Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. „Urban water cycle processes and interactions“ by Marsalek et al (2006), Publication No. 78, UNESCO, Paris.

3. „Frontiers in Urban Water Management – Deadlock or Hope“ by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing.

Web References:

1. http://nptel.ac.in/courses/105105048/M7L7.pdf
2. http://nptel.ac.in/courses/105105048/8
3. http://njscdea.ncdea.org/CurveNumbers.pdf
4. http://www.iitg.ac.in/kartha/CE551/Lectures/Lecture16.pdf

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IV Year-I Semester

L	T	P	C
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16CE7D05 - REPAIR & MAINTENANCE OF STRUCTURES

(Elective –I)

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with deterioration of concrete in structures.
- Equip student with concepts of NDT and evaluation.
- Understand failures and causes for failures in structures.
- Familiarize different materials and techniques for repairs.
- Understand procedure to carryout Physical evaluation of buildings and prepare report.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Understand deterioration of concrete in structures	Knowledge
CO2	Evaluate structures by NDT	Applying
CO3	Assess failures and causes of failures in structures.	Evaluation
CO4	Understand repair and rehabilitation techniques	Knowledge
CO5	Carryout Physical evaluation and submit report on condition of the structure.	Applying
CO6	Application of materials for repair and rehabilitation	Applying

SYLLABUS:

UNIT - I

Deterioration of concrete in structures: Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes, Mechanism, Effect, preventive measures. - Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures.

UNIT- II

Non Destructive Testing- Non-destructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance

and Pull out test, Core cutting- Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT- III

Failure of buildings: Definition of building failure-types of failures- Causes of Failures- Faulty Design, Accidental over Loading, Poor quality of material and Poor Construction practices- Fire damage - Methodology for investigation of failures-diagnostic testing methods and equipment‟s-repair of cracks in concrete.

UNIT- IV

Materials for repair and rehabilitation -Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates-Concrete behaviour under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

UNIT - V

Repair Techniques: Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes.

UNIT - VI

Investigation of structures: Distress, observation and preliminary test methods. Case studies: related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures.

Text Books:

1. „Maintenance & Repair of Civil Structures‟ by B.L. Gupta & Amit Gupta.
2. „Rehabilitation of Concrete Structures‟ by B. Vidivelli, Standard Publishers.
3. „Concrete Bridge Practice Construction, Maintenance & Rehabilitation‟ by V. K. Raina.

References:

1. „Concrete Structures- protection Repair and Rehabilitation‟ by R. Doodge Woodson, BH Publishers.

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IV Year-I Semester

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16CE7D06 - TRAFFIC ENGINEERING

(Elective –I)

Course Learning Objectives:

- To know various components and characteristics of traffic.
- To know various traffic control devices and principles of highway safety.
- To understand the detrimental effects of traffic on environment.
- To know highway capacity and level of service concepts.
- To learn about intelligent vehicle highway systems.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Discover Parking Problems and manage traffic regulations	Create
CO2	Determine traffic speed, volume, travel time and Density	Analyzing
CO3	Design traffic signals.	Remembering
CO4	Discover traffic-environment problems.	Create
CO5	Build Knowledge of traffic Capacity and Level OF service	Remembering
CO6	Develop vehicle highway systems.	Applying

SYLLABUS:

UNIT- I

Components Of The Traffic System: Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies: Inventories; Volume studies; Speed, Travel time and Delay studies; Intersection studies; Pedestrian studies; Parking studies; Accident studies. Types of parking facilities – On street parking and Off-street Parking facilities; Parking studies and analysis- Parking Inventory Study, Parking Usage Study By Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Volume, Parking Index.

UNIT- II

Traffic Characteristics: Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics – Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car-following theories; Density measurement techniques; Density contour maps.

UNIT- III

Traffic Control Devices & Highway Safety: Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Webster method; ARRB method; Drew‟s Method; IRC method; Signal coordination; Area Traffic control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

UNIT- IV

Environmental Considerations: Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control. Measures to curtail environmental degradation due to traffic.

UNIT- V

Highway Capacity And Level Of Service: Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards.

UNIT- VI

Intelligent Vehicle – Highway Systems: Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS.

Text Books:

1. „Traffic Engineering: Theory and Practice‟ by Pignataro LJ., Prentice hall, Inc.
2. „Traffic and Transport planning‟ by Kadiyali L.R., Khanna Publishers.

References:

1. „Traffic Engineering Hand Book‟ by Institute of Transportation Engineers, 4 Ed., Prentice Hall.
2. „Traffic Engineering‟ by Mc Shane, WR and RP Roess, Prentice Hall.

3. „Highway Traffic analysis and design“ by Salter RJ and NB Hounsell, 3rd ed., Macmillan.
4. „Traffic Planning and Engineering“ by Hobbs FD., Pergamon press.
5. „Traffic flow fundamentals“ by May, AD., Prentice Hall.

Web References:

1. http://nptel.ac.in/courses/105101008/12

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IV Year-I Semester

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16CE7D07 - EARTHQUAKE RESISTANT DESIGN

(Elective –II)

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with Engineering Seismology.
- Equip student with concepts of Structural Dynamics.
- Understand Concepts of Seismic Design.
- Familiarize with Design philosophies for Seismic loading.
- Familiarize students with various IS codal provisions for ductile design and detailing.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcomes	Description	Cognitive Level
CO1	Explain fundamentals of Engineering Seismology.	Comprehension
CO2	Acquaint with the principles Structural dynamics.	Knowledge
CO3	Solve SDOF Systems and suggest ductile design.	Applying
CO4	Compute equivalent lateral seismic loads and carryout a seismic design as per IS codal provisions.	Analyse
CO5	Seismic Analysis and design of simple 2-storied RC Building frame	Analyse
CO6	Understand about ductile detailing of flexural members as per IS 13920	Understand

SYLLABUS:

UNIT-I

Engineering seismology – rebound theory – plate tectonics – seismic waves - Earthquake size and various scales – local site effects – Indian seismicity – seismic zones of India – theory of vibrations – near ground and far ground rotation and their effects.

UNIT-II

Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings – Formulation of the Equations of Motion– Elements of a Vibratory system – Degrees of Freedom - Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped –

Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor.

UNIT-III

Seismic design concepts – EQ load on simple building – load path – floor and roof diaphragms – seismic resistant building architecture – plan configuration – vertical configuration – pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic code (IS 1893 & 13920) – Building system – frames – shear wall – braced frames – layout design of Moment Resisting Frames (MRF) – ductility of MRF – Infill wall – Non-structural elements.

UNIT-IV

Calculation of equivalent lateral force- Design Base Shear- Storey Shear, Estimation of Natural period of Structure, Computation of Response acceleration Coefficient- Zone factor- Seismic weight- Response reduction factors- Seismic Coefficient Method.

UNIT-V

Design and ductile detailing of Beams and columns of frames -Concept of strong column weak beams, Ductility criteria for earthquake resistant design, Ductile detailing of flexural members as per IS 13920- Longitudinal reinforcement, Shear reinforcement, Anchorage of reinforcement-Development length, Lap Splices.

UNIT-VI

Seismic Analysis and design: simple 2-storied RC Building frame – Equivalent static lateral force method and response spectrum method.

Text Book:

1. „Earthquake Resistant Design of Structures" -Pankaj Agarwal and Manish ShriKhande, Prentice – Hall of India, 2007, New Delhi.
2. „Earthquake Resistant Design of Building Structures" by VinodHosur, Wiley India Ltd.
3. „Reinforced Concrete Design" by A. K. Jain.

References:

1. „Introduction to the Theory of Seismology" by Bullen K.E., Great Britain at the University Printing houses, Cambridge University Press 1996.
2. Relevant code of practices

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IV Year-I Semester

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16CE7D08 - ADVANCED FOUNDATION ENGINEERING

(Elective –II)

Course Learning Objectives:

The objective of this course is:

- To enable the student to appreciate how Meyerhof‟s general bearing capacity equations are important over Terzaghi‟s bearing capacity equation.
- To teach the student special methods of computation of settlements and the corrections to be applied to settlements.
- To enable the student to understand the advanced concepts of design of pile foundations.
- To teach the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.
- To enable the student to learn the difference between isolated and combined footings, the determination of bearing capacity of mats and proportioning of footings.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Understand the advanced methods of settlement computations and proportion foundation footings.	Creating
CO2	Appreciate the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.	Understanding
CO3	Appreciate the problems posed by expansive soils and the foundations practices devised.	Understanding
CO4	Appreciate the difference between isolated footings and combined footings and mat foundations.	Knowledge
CO5	Compute the safe bearing capacity of footings subjected to vertical and inclined loads.	Applying
CO6	Analyse the lateral stability of pile and well foundations.	Analyse

SYLLABUS:

UNIT-I

Bearing Capacity of Foundations: General bearing capacity equation –Meyerhof‟s, Brinch Hansen‟s and Vesic‟s methods.

UNIT-II

Settlement analysis: Immediate settlement of footings resting on granular soils – Schmertmann& Hartman method – De Beer and Martens method -Immediate settlement in clays – Janbu‟s method – correction for consolidation settlement using Skempton and Bjerrum‟s method – Correction for construction period.

UNIT-III

Mat Foundations– Purpose and types of isolated and combined footings –Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils – compensated rafts.

UNIT-IV

Earth-Retaining Structures –cantilever sheet piles – anchored bulkheads –fixed and free earth support methods – design of anchors – braced excavations – function of different components – forces in ties – stability against bottom heave.

UNIT-V

Pile foundations – single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils – Davisson and Gill method– Brom‟s analysis.

UNIT-VI

Foundations in expansive soils – definitions of swell potential and swelling pressure – determination of free swell index – factors affecting swell potential and swelling pressure – foundation practices – sand cushion method– CNS layer - drilled piers and belled piers – under-reamed piles – moisture control methods.

Text Books:

1. „Basic and applied soil mechanics‟ by GopalRanjan and ASR Rao, New Age Publishers.
Civil Engineering 199
2. „Soil Mechanics and Foundation Engineering‟ by VNS Murthy, CBS Publishers.
3. „Principles of Foundation Engineering‟ by BM Das, Thomson Brooks/Cole.

Reference Books:

1. „Foundation Analysis and Design“ by JE Bowles, John Wiley.

2. „Foundation Design“ by WC Teng, Prentice Hall Publishers.

Mr.B R N Murthy

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IV Year-I Semester **L T P C**

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16CE7D09 - ADVANCED STRUCTURAL ENGINEERING

(Elective –II)

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with Raft Foundations and Retaining walls.
- Equip student with concepts of design of different types of RCC water tanks.
- Understand Concepts of flat slabs.
- Familiarize different types of Bunkers, Silos and Chimneys.
- Understand different types of transmission towers.
- Understand the efficiency of counter- fort retaining walls with gravity retaining walls.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Design raft foundations and different types of RCC retaining walls.	Create
CO2	Carryout analysis and design of different types of RCC water tanks.	Analyse
CO3	Carryout analysis and Design of Flat Slabs.	Analyse
CO4	Solve the problems design of RCC Bunkers, Silos.	Create
CO5	Solve the problems design of Chimneys.	Create
CO6	Understand various types of transmission towers.	Understand

SYLLABUS:

UNIT-I

Analysis and Design of Raft Foundations – Design of RCC Retaining walls: Cantilever and Counter fort.

UNIT–II

Analysis and Design of RCC Water Tanks: Circular and Rectangular types- Intze tank including staging.

UNIT–III

Analysis and Design of Flat Slabs- Direct Design and Equivalent Frame Methods- Check for Punching shear.

UNIT- IV

Analysis and Design of Bunkers and Silos: Concepts of Loading.

UNIT-V

Analysis and Design of Chimney, Concepts of loading.

UNIT-VI

Introduction to Steel Transmission Towers - Principles and procedures.

Text Books:

1. „Reinforced Concrete Structures" Vol-2 by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. „Reinforced Concrete Structures" by N. Subrahmanian, Oxford Publishers.
3. „Design Drawing of Concrete and Steel Structures" by N. Krishna Raju University Press 2005.

References:

1. „Essentials of Bridge Engineering" by D. Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. „Reinforced concrete design" by S. U, Pillai and D. Menon, Tata Mc.Grawhill Publishing Company
3. Codes: Relevant IS: codes.

INTERNAL EXAMINATION PATTERN:

The total internal marks (40) are distributed in two components as follows:

1. Descriptive (subjective type) examination: 30 marks
2. Assignment : 10 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

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IV Year-I Semester **L T P C**

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16CE7D10 - PAVEMENT ANALYSIS & DESIGN

(Elective –II)

Course Learning Objectives:

The objective of this course is:

- To know various factors affecting pavement design.
- To know various concepts for the stresses in pavements.
- To understand material characterization and mix design concepts.
- To acquire design principles of flexible and rigid pavements.
- To acquire design principles of shoulders, overlays and drainage.
- To know various traffic control devices and principles of highway safety.
- To understand the detrimental effects of traffic on environment.
- To know highway capacity and level of service concepts.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Know the factors affecting the pavement design.	Knowledge
CO2	Determine the stresses under the wheel loads.	Evaluation
CO3	Know the concepts of material characterisation & mix design.	Knowledge
CO4	Designof flexible pavements.	Create
CO5	Design of rigid pavements.	Create
CO6	Design Of Shoulders, Overlays & Drainage	Create

SYLLABUS:

UNIT-I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT,

AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT-II

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

UNIT-III

Material Characterisation & Mix Design Concepts: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics; Marshall‟s and Hveem‟s Methods of Bituminous Concrete Mix Design, Field Implications of Stability and Flow Values, Introduction to Super Pave Mix Design, IRC Cement Concrete Mix Design.

UNIT-IV

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute‟s Methods with HMA and other Base Combinations, AASHTO, Road Note No 29 & IRC Methods, Design of Runways & Taxiways, Design of Low Volume Rural Roads. Serviceability Concepts, Visual Rating, Pavement Serviceability Index

UNIT-V

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

UNIT-VI

Design Of Shoulders, Overlays & Drainage: Shoulder Design Considerations, Traffic Prediction, Parking, Regular & Encroaching Traffic, Thickness Design Specifications for Flexible & Rigid Shoulders; Types & Design of Overlays: AI‟s Principal Component Analysis & IRC Methods of Overlay Design, Importance of Profile Correction Course;

Pavement Drainage Concepts, Drainage Related Failures, Inflow-Outflow Concepts, Condition of Continuity, Surface and Sub Surface Drainage Design Specifications.

Text Books:

1. „Pavement Analysis and Design" by Yang H. Huang, Pearson Education, Second Edition.
2. „Principles of Pavement Design" by Yoder.J. &Witczat Mathew, W. John Wiley & Sons Inc.
3. „Pavement Design" by Srinivasa Kumar R, Universities Press, Hyderabad.
4. „Traffic Engineering" by Mc Shane, WR and RP Roess, Prentice Hall.

References:

1. „Design of Functional Pavements" by Nai C. Yang, McGraw Hill Publications.
2. „Concrete Pavements" by AF Stock, Elsevier, Applied Science Publishers.
3. „Pavement and Surfacing"s for Highway & Airports" by MichealSargious, Applied Science Publishers Limited.
4. „Dynamics of Pavement Structures" by G. Martineek, Chapmen & Hall Inc.
5. „Principles of Transportation Engineering" by PathaChakroborty and Animesh Das, PHI Learning Private Limited, Delhi.
6. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall Publication.

E-References:

- http://nptel.ac.in/syllabus/syllabus.php?subjectId=105105044
- http://nptel.ac.in/syllabus/syllabus.php?subjectId=105107064

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IV Year-I Semester

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16CE7D11 - GROUND WATER DEVELOPMENT

(Elective –II)

Course Learning Objectives:

The course is designed to

- Appreciate groundwater as an important natural resource.
- Understand flow towards wells in confined and unconfined aquifers.
- Understand the principles involved in design and construction of wells.
- Create awareness on improving the groundwater potential using various recharge techniques.
- Know the importance of saline water intrusion in coastal aquifers and its control measures.
- Appreciate various geophysical approaches for groundwater exploration.
- Learn groundwater management using advanced tools.
- Know the different types of aquifiers.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Estimate aquifer parameters and yield of wells.	Evaluate
CO2	Analyse radial flow towards wells in confined and unconfined aquifers.	Analysis
CO3	Design wells and understand the construction practices.	Create
CO4	Interpret geophysical exploration data for scientific source finding of aquifers.	Apply
CO5	Determine the process of artificial recharge for increasing groundwater potential.	Evaluation
CO6	Take effective measures for controlling saline water intrusion.	Understand

SYLLABUS:

UNIT – I

Introduction: Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation. Well Hydraulics Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jocob and Chow‟s methods, Leaky aquifers.

UNIT – II

Well Design: Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT III

Well Construction and Development: Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open-hole, bail- down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT IV

Artificial Recharge: Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge.

Saline Water Intrusion: Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

UNIT – V

Geophysics: Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications.

UNIT – VI

Groundwater Modelling and Management: Basic principles of groundwater modelling-Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

Text Books:

1. „Groundwater“ by Raghunath H M, New Age International Publishers, 2005.
2. „Groundwater Hydrology“ by Todd D.K., Wiley India Pvt Ltd., 2014.
3. „Groundwater Hydrology“ by Todd D K and L W Mays, CBS Publications, 2005.

References:

1. „Groundwater Assessment and Management“ by Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. „Groundwater Hydrology“ by Bouwer H, McGraw Hill Book Company, 1978.
3. „Groundwater Systems Planning and Management“ by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. „Groundwater Resources Evaluation“ by Walton W C, McGraw Hill Book Company, 1978.

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IV Year-I Semester

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16CE7D12 - ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT

(Elective –II)

Course Learning Objectives:

The objective of this course is:

- To impart knowledge on different concepts of Environmental Impact Assessment.
- To know procedures of risk assessment
- To learn the EIA methodologies and the criterion for selection of EIA methods.
- To pre-requisites for ISO 14001 certification
- To know the procedures for environmental clearances and audit
- To appreciate the importance of stakeholder participation in EIA

Course Learning Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Prepare EMP, EIS, and EIA report	Apply
CO2	Identify the risks and impacts of a project	Identify
CO3	Selection of an appropriate EIA methodology	Identify
CO4	Evaluation the EIA report	Evaluation
CO5	Estimate the cost benefit ratio of a project	Apply
CO6	Know the role of stakeholder and public hearing in the preparation of EIA	Knowledge

SYLLABUS:

UNIT – I

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map-Classification of environmental parameters – role of stakeholders in the EIA preparation –stages in EIA.

UNIT – II

EIA Methodologies: introduction, Criteria for the selection of EIA Methodology, EIA methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

UNIT-III

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives-application of remote sensing and GIS for EIA.

UNIT-IV

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - EIA with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, generalized approach for assessment of Air pollution Impact.

UNIT – V

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment.

UNIT-VI

EIA notification by Ministry of Environment and Forest (Govt. of India): Provisions in the EIA notification, procedure for environmental clearance, and procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, Evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

- Environmental Impact Assessment, Canter Larry W.,McGraw-Hill education Edi (1996)
- Environmental Impact Assessment Methodologies, by Y.Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.

References:

- Environmental Science and Engineering, by J. Glynn and Gary W.HeinKe – Prentice Hall Publishers.
- Environmental Science and Engineering, by Suresh K. Dhaneja – S.K. Katania& Sons Publication, New Delhi.
- Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd., Delhi.

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IV Year-I Semester

L	T	P	C
0	0	3	2

16CE7L10 - IRRIGATION DRAWING & CAED PRACTICE

Course Objectives:

The objective of this course is:

- To enhance the students knowledge and skills in Irrigation drawing.
- To introduce computer aided drafting packages and commands for modelling and sketching.
- To learn surface modelling techniques required designing and machining
- To draw the geometric entities and create 2D and 3D wire frame models.
- To learn various modelling techniques such as edit, zoom, cross hatching, pattern filling, rotation, etc.

Course outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Able to know all the design of irrigation structures	Create
CO2	Design the surplus weir, canal regular	Create
CO3	Plotting the irrigation structures to CAD	Apply
CO4	Basically idea about all Irrigation structural components.	Knowledge
CO5	Generate assembly of various components of compound solids.	Understand
CO6	Develop the components using 2D and 3D wire frame models through various editing commands.	Apply

SYLLABUS:

UNIT-I

SURPLUS WEIR:

Introduction, Estimation of flood discharge, Design, The effect of Absorption capacity on the design of the waste weirs. Detailing of Surplus weir design on sheet.

UNIT-II

TANK SLUICE WITH TOWER HEAD:

Design, Ayacut, vent-way, sluice barriel, R.C.slab, side walls, Earth pressure, weight transmitted by the Roof slab, Weight of Earth on the Top side of wall Beyond the slab, Weight of Earth standing on the slope of side wall, weight of masonry side wall, stability analysis, Tower Head, Checking the thickness of well at +36.50; checking thickness of well at +34.00; Cistern in Rear of the Barrel, Specifications. Detailing of design of Tank sluice with Tower head on sheet.

UNIT-III

DIRECT SLUICE:

Hydraulic particulars of Main Canal; Hydraulic particulars of the Dis- tributary; sluice vent-way; Design of Sluice Barriel; section across the sluice Barrel; Design of Roof slab; Design of head walls, Wing walls on the upstream side; Return wall; Specifications. Detailing of design of Direct Sluice on Sheet.

PART- B COMPUTER AIDED DRAFTING

UNIT- IV

Introduction To Computer Aided Drafting: Generation of points, lines, curves, polygons, dimensioning. Types of modelling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modelling, and 3D wire frame modelling.

UNIT -V

Objective: By going through this topic the student will be able to understand the paper-space environment thoroughly. View Points and View Ports: view point coordinates and view(s) displayed, examples to exercise different options like save restore, delete, joint, single option.

UNIT -VI

Computer Aided Solid Modelling: Isometric projections, orthographic projections of isometric projections, modelling of simple solids, Modelling of Machines & Machine Parts.

Text Book:

- A text book Water Resources Engineering (principles and practice) by SatyaNarayanaMurtyChalla by New Age International publishers.

References:

- Mastering Auto CAD 2017 and Auto CAD LT 2017 – George Omura, Sybex.
- Auto CAD 2017 fundamentals- Elisemoss, SDC Publ.
- Engineering Drawing and Graphics using Auto Cad–T Jeyapoovan, vikas.

- Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age.
- Text book of Engineering Drawing with auto-CAD, K.Venkata Reddy/B.S . Publications.

Internal Evaluation: Max. Marks: 40

The total internal evaluation marks are distributed in following two components:

- Day-to-day work : 20 marks
- Internal test : 20 marks
- I Mid (Internal Test 1) Examination Part A - Irrigation drawing Exam
- II Mid (Internal Test 2) Examination Part B - In Computer Lab

Note: The duration of the internal test is 2 hours and it must be conducted as per the schedules notified. End Semester Examination (Total Duration: 4 Hours, Max. Marks: 60)

PART A – Irrigation drawing pattern (Duration: 3 Hours, Marks: 30)

PART B – Computer lab pattern using any drafting packages (Duration: 2 Hours, Marks: 30)

(Note: both PART A and PART B are compulsory and are to be conducted in separate sessions)

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IV Year-I Semester

L	T	P	C
0	0	3	2

16CE7L11 - GIS & CAD LAB

Course Learning Objectives:

The course is designed to**:**

- Introduce image processing and GIS software.
- Familiarize structural analysis software.
- Understand the process of digitization, creation of thematic map from toposheets and maps.
- Learn to apply GIS software to simple problems in water resources and transportation engineering.
- Learn to analyse 2 D and 3D frame steel tubular truss using structural analysis software.
- Learn to analyse and design retaining wall and simple towers.

Course outcomes:

By the end of successful completion of this course, the students will be able to:

Course Outcome	Description	Cognitive level
CO1	Compile a rectification/ geo-referencing of scanned images by assigning latitudes and longitudes or x,y coordinates.	Create
CO2	Digitize, create and classification of thematic map.	Create
CO3	Discriminate between special and non-spatial data	Understand
CO4	Develop digital elevation model.	Create
CO5	Use structural analysis software to analyse and design 2D and 3D frames	Analyse
CO6	Design and analyse retaining wall and simple towers using CAD software.	Analyse

GIS SOFTWARES:

- Arc GIS 9.0
- ERDAS 8.7
- MapInfo 6.5
- Any one or Equivalent.

Excercises in GIS:

1. Digitization of Map/Toposheet.
2. Creation of thematic maps.
3. Estimation of features and interpretation.
4. Developing Digital Elevation model.
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.

COMPUTER AIDED DESIGN AND DRAWING SOFTWARE:

1. STAAD PRO / Equivalent
2. STRAP
3. STRUDS

Excercisies:

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

TEXT BOOK:

1. „Concept and Techniques of GIS‟ by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8T23 - CONSTRUCTION TECHNOLOGY & MANAGEMENT

Course Learning Objectives:

The objective of this course is:

- To introduce to the student the concept of project management including network drawing and monitoring.
- To introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery.
- To introduce the importance of safety in construction projects.
- To introduce the importance of Man power in Construction projects.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Apply the project management techniques for construction planning	Application
CO2	Apply the project management for Solve and upgrade the PERT Technique by using resources in construction	Application
CO3	Plan the suitable equipment‟s in various tasks of civil engineering projects.	Synthesis
CO4	Apply the safety requirements and quality control aspects in projects	Application
CO5	Understand the planning of Man power in contruction projects in suitable tasks	Understand
CO6	Plan the suitable construction methods for the site execution.	Synthesis

SYLLABUS:

UNIT- I

Construction Project Management and its Relevance– qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method.

UNIT -II

Project Evaluation and Review Technique– cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources.

UNIT- III

Construction Equipment– economical considerations – earthwork equipment– Trucks and handling equipment – rear dump trucks – capacities of trucks. Handling equipment – calculation of truck production – compaction equipment – types of compaction rollers.

UNIT -IV

Hoisting and Earthwork Equipment– hoists – cranes – tractors - bulldozers – graders – scrapers– draglines -clamshell buckets.

UNIT -V

Concreting Equipment– crushers – jaw crushers – rotary crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing.

UNIT -VI

Construction Methods– earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering. Man power planning in construction projects.

Text Books:

1. „Construction Planning, Equipment and Methods" by Peurifoy and Schexnayder, Shapira, Tata M c Graw hill.
2. „Construction Project Management Theory and Practice" by Kumar NeerajJha (2011), Pearson.
3. „Construction Technology" by Subir K. Sarkar and SubhajitSaraswati, Oxford University press.
4. Construction project management By K. K CHITKARA,Tata M c Graw hill.

References:

1. „Construction Project Management - An Integrated Approach“ by Peter Fewings, Taylor and Francis.
2. „Construciton Management Emerging Trends and Technologies“ by Trefor Williams, Cengage learning.
3. Construction planning and management By P S GHALOT and B M DHIR

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IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8T24 - ESTIMATING, SPECIFICATIONS & CONTRACTS

Course Learning Objectives:

The objective of this course is to enable the students to:

- Understand the quantity calculations of different components of the buildings.
- Understand the rate analysis of different quantities of the buildings components.
- Learn various specifications and components of the buildings.
- To study estimation of buildings including R.C.C. members.
- To study rate analysis.
- To bring about an exposure to field problems associated with roads/bridge marking and estimation of roadwork quantities.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Determine the quantities of different components ofbuildings.	Applying
CO2	Analyse of civil engineering projects along with quantities.	Analysing
CO3	Estimate the value of existing infrastructure.	Analysing
CO4	Knowledge on methods of valuation and forestimating cost depreciations & types of contractsand tenders.	Knowledge
CO5	Identify, analyse and solving problems on estimation of buildings.	Analysing
CO6	Estimate the cost of various building components.	Applying

SYLLABUS:

UNIT – I

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

UNIT – II

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

UNIT-III

Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

Detailed Estimation of Public Structures like Bridges, water tanks and soak pits, septic tanks.

UNIT – IV

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

UNIT-V

Detailed Estimation of Buildings using individual wall method.

UNIT –VI

Detailed Estimation of Buildings using centre line method.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

Text Books:

1. „Estimating and Costing" by B.N. Dutta, UBS publishers,2000.
2. „Civil Engineering Contracts and Estimates" by B. S. Patil, Universities Press (India) Pvt. Ltd.,Hyd.
3. „Construction Planning and Technology" by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. NewDelhi.
4. „Estimating and Costing" by G.S.Birdie.

References:

1. ‘Standard Schedule of rates and standard data book‟ by public works department.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works –B.I.S.)
3. „Estimation, Costing and Specifications‟ by M. Chakraborthi; Laxmi publications.
4. National BuildingCode.

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IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8T25 - PRESTRESSED CONCRETE

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with concepts of prestressing.
- Equip student with different systems and devices used in prestressing.
- Understand the different losses of prestress including short and long term losses.
- Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion.
- To be able to understand the major difference between R.C.C Design and P.S.C.Design

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Perceive the different methods of prestressing.	Understand
CO2	Analyze and design prestressed concrete beams under flexure and shear Resistance.	Analyse
CO3	Understand the various losses in prestressed concrete systems.	Understand
CO4	Evaluate the effective prestress including the short and long term losses.	Evaluation
CO5	Understand the relevant IS Codal provisions for prestressed concrete	Understand
CO6	Understand the Anchorage Zone reinforcement.	Understand

SYLLABUS:

Unit – I

Introduction: Historic development – General principles of prestressing, pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics. I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post

tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

Unit – II

Analysis of Sections for Flexure: Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons. Concept of load balancing method, pressure line (Trust), Cracking moment for mid and end support conditions.

Unit III

Losses of Prestress:Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

UNIT-IV

Design for flexural resistance: Design for Flexural resistance- Types of flexural failure – Code procedures-Design of sections for flexure- Control of deflections- Factors influencing- Prediction of short term and long term deflections.

UNIT-V

Design for Shear and Torsion- Shear and Principal Stresses: Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

UNIT-VI

Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- End zone reinforcement- Codal provisions- Anchorage zone stresses in Post tensioned members- Stress distribution in End block- Anchorage Zone reinforcement.

TEXT BOOKS:

1. „Prestressed Concrete" by N. Krishna Raju, Tata McGraw hill.
2. „Prestressed Concrete" by S. Ramamrutham.

REFERENCES:

1. „Prestressed Concrete" by P. Dayaratnam.
2. „Prestressed Concrete" by T. Y. Lin & Burns, Wiley Publications.

E-References:

1. http://freevideolectures.com/Course/94/Prestressed-Concrete-Structures

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IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8D13 - SOIL DYNAMICS & MACHINE FOUNDATION
(Elective – 3)

Course Learning Objectives:

This course on „Soil Dynamics" discusses:

- About the fundamentals of vibrations.
- About the behaviour and properties/response of soil as a material which is subjected to various types of dynamic or cyclic time dependent loadings.
- The design and analysis for machine foundations.
- Discusses about the laboratory and filed tests to compute the dynamic soil properties of the soil mass.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Understand the dynamic behaviour of foundation.	Understand
CO2	Conduct laboratories and field tests to collect dynamic soil prosperities and its interpretation.	Applying
CO3	Design the machine foundations based on the loads and soil conditions.	Creating
CO4	Understand the behaviour of soil under dynamic loading using theory of vibrations	Evaluating
CO5	Draw free body diagrams of machine foundations.	Knowledge
CO6	Design the vibration isolators and vibration machines.	Create

SYLLABUS:

UNIT-I

Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping – Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect - magnification-logarithmic decrement –Transmissibility.

UNIT-II

Theories of Vibration Analysis- EHS Theory and lumped parameter model-Different modes of vibration- Natural frequency of foundation soil system –Barkan and IS methods – Pressure bulb concept – Reisner Theory –Limitations of Reisner theory – Sung‟s solutions -- Pauw‟s Analogy –Heigh‟s Theory.

UNIT-III

Dynamic properties of soils: Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.– Block vibration test –Determination of Damping factor.

UNIT-IV

Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.

UNIT-V

Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.

UNIT-VI

Vibration Isolation: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes Special Topics: Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction - Dynamic bearing capacity, Earth retaining structures under dynamic loads.

Text Book:

1. „Vibrations of Soils and Foundations‟ by Richart Hall and Woods.

References:

1. „Vibration Analysis and Foundation Dynamics‟by NSV Kameswara Rao, Wheeler Publishing, New Delhi.
2. „Foundations of Machines- Analysis and Design‟ by Prakash and Puri.
3. „Analysis and design of Foundations for Vibrations‟ by P J Moore.
4. „Fundamentals of Soil Dynamics‟ by B M Das.
5. „Dynamics of bases and Foundations‟ by D DBarkan.

Web Reference:

1. http://www.nptelvideos.in/2012/11/soil-dynamic.html

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IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8D14 - SOLID AND HAZARDOUS WASTE MANAGEMENT
(Elective – 3)

Course Learning Objectives:

The objective of this course is:

- To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.
- To acquire the principles of treatment of municipal solid waste.
- To know the impact of solid waste on the health of the living beings.
- To learn the criterion for selection of landfill and its design.
- To plan the methods of processing such as composting the municipal organic waste.

Course Learning Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Design the collection system of a solid waste of a town.	Creating
CO2	Analysis and handling of solid waste collection.	Analysis
CO3	Know the criteria for selection of landfill	Knowledge
CO4	Characterise the solid waste and design a composting facility	Evaluating
CO5	Understand the processing and treatment of solid waste	Understand
CO6	Appraise the current practices available and methods of handling sampling and disposal of solid waste.	Apply

SYLLABUS:

UNIT- I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste – Factors Influencing generation of solid waste – sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT- II

Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste Collection of Solid Waste: Type and methods of waste collection systems, analysis of

collection system – optimization of collection routes– alternative techniques for collection system.

UNIT- III

Transfer and Transport: Need for transfer operation, compaction of solid waste – transport means and methods, transfer station types and design requirements.

UNIT- IV

Separation and Transformation of Solid Waste: unit operations used for separation and transformation: shredding – materials separation and recovery, source reduction and waste minimization.

UNIT- V

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT- VI

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

TEXT BOOKS:

1. George Techobanoglous "Integrated Solid Waste Management", McGraw Hill Publication, 1993

REFERENCES:

1. Vesilind, P.A., Worrell, W., Reinhart, D. "Solid Waste Engineering", Cenage learning, New Delhi, 2004
2. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.

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IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8D15 - BRIDGE ENGINEERING
(Elective – 3)

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with different types of Bridges and IRC standards.
- Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts.
- Understand concepts of design of Plate Girder Bridges
- Familiarize with different methods of inspection of bridges and maintenance.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Know about Bridges with diagrams and Loading standards.	Apply
CO2	Design of Slab bridges and suggest structural detailing.	Create
CO3	Design of Plate girder bridges.	Create
CO4	Organize for attending inspections and maintenance of bridges and prepare reports.	Evaluation
CO5	Design of box culverts and suggest structural detailing.	Create
CO6	Design of T beam bridge.	Create

SYLLABUS:

UNIT-I

Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading.

UNIT-II

Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon‟s – Massonet Method –Hendry- Jaegar Methods- Courbon‟s theory- Pigeaud‟s method.

UNIT-III

T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, longitudinal girders, and Secondary beams- Reinforcement detailing.

UNIT-IV

Plate Girder Bridges: Elements of plate girder and their design-web- flange-intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V

Box Culverts: Loading –Analysis and Design- Reinforcement detailing.

UNIT-VI

Inspection and Maintenance of Bridges: Procedures and methods for inspection – Testing of bridges- Maintenance of Sub Structures and Superstructures- Maintenance of bearings- Maintenance Schedules.

INTERNAL EXAMINATION PATTERN:

The total internal marks (40) are distributed in two components as follows:

1. Descriptive (subjective type) examination: 30marks
2. Assignment: 10 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

Text Book:

1. „Essentials of Bridge Engineering" by Jhonson Victor D.
2. „Design of Bridge Structures" by T. R. Jagadeesh, M.A. Jayaram, PHI.
3. „Design of RC Structures" by B. C. Punmai, Jain & Jain, Lakshmi Publications.

References:

1. „Design of Concrete Bridges“ by Aswini, Vazirani, Ratwani.
2. „Design of Steel Structures“ by B. C. Punmai, Jain & Jain, Lakshmi Publications.
3. „Design of Bridges“ by Krishna Raju.

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IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8D16 - WATER RESOURCE SYSTEM PLANNING
(Elective – 3)

Course Learning Objectives:

The course is designed to:

- Introduce the concepts of system analysis in the planning, design, and operation of water resources.
- Appreciate mathematical optimization methods and models.
- Learn and apply basic economic analysis tools to water resources projects.
- Understand linear, nonlinear and dynamic programming techniques and apply them to various water resources systems planning and design problems.
- Appreciate simulation and management techniques in water resources systems.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Apply optimization methods related to water resource systems.	Apply
CO2	application of linear programming in water resources	Apply
CO3	Formulate optimization models for decision making in water resources systems.	Apply
CO4	Simulate models for planning and design of Water Resources Systems.	Analysis
CO5	Understand the Non- Linear Optimization Techniques in water resources.	Understand
CO6	Perform basic economic analysis to evaluate the economic feasibility of water resources projects.	Evaluation

SYALLABUS

UNIT-I

Introduction: concepts of systems analysis, definition. Systems approach to water resource planning, role of optimization models, objective function and constraints, types of optimization techniques.

UNIT- II

Linear Programming: Formation of linear programming models, graphical methods, simplex method, application of linear programming in water resources.

UNIT-III

Linear Programming: Revised simplex method, duality in linear programming, sensitivity and past optimality analysis.

UNIT-IV

Dynamic Programming:principles of optimality forward and backward recursive dynamic programming, case of dimensionality, application for resource allocation.

UNIT-V

Non- Linear Optimization Techniques: Critical method of optimization, Kuch – Tucleer, gradential based research techniques for simple unconstrained optimization.

UNIT-VI

i) Simulation: Application of simulation techniques in water resources.

ii) Water Resource Economics: Principles of Economic analysis benefit – cost analysis socio economic intuitional pricing of water resources.

TEXT BOOKS:

1. Water resource system analysis – Vedula&Mujumdar – Tata Mc. Graw hill company Ltd. 2005.
2. Water resources Economics – James & Lee. Oxford publishers 2005.

REFERENCE BOOK:

1. Optimal design of water distribution networks P.R.Bhave, Narosi publishing house 2003.

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IV Year-II Semester

L	T	P	C
3	1	0	3

16CE8D17 - TRANSPORTATION PLANNING ENGINEERING
(Elective – 3)

Course Learning Objectives:

The objective of this course is:

- To learn various procedures for travel demand estimation.
- To various data collection techniques for OD data.
- To know various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
- To develop alternative urban transport network plans.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

Course outcome	Description	Cognitive level
CO1	Evaluate various alternative transportation proposals.	Analysing
CO2	Identify the corridor and plan for providing good transportation facilities.	Remembering
CO3	Describe the fundamental parameters and relationships that characterize the operation of a transportation facility.	Analysing
CO4	Describe methods of monitoring, assessing and improving the performance of transportation facilities.	Analysing
CO5	Estimate the demand for a transportation facility using the four-step planning process.	Analysing
CO6	Apply queuing models to evaluate the performance of a transportation system.	Applying

SYLLABUS:

UNIT –I

Urban Transportation Problems & Travel Demand: Urban Issues, TravelCharacteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT –II

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

UNIT –III

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT –IV

Mode Choice Analysis: Mode Choice Behavior, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

UNIT –V

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Economic evaluation techniques – Road user cost, Net present value method, Benefit cost ratio method, internal rate of return method, comparison of various methods

UNIT –VI

Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies

Text Books:

1. „Introduction to Urban System Planning“ by Hutchinson, B.G., McGraw Hill.
2. „Transportation Engineering - An Introduction“ by Khisty C.J., Prentice Hall.
3. „Fundamentals of Transportation Planning“ by Papacostas, Tata McGraw Hill.

References:

1. „Urban Transportation Planning: A decision oriented Approach“ by Mayer M and Miller E, McGraw Hill.
2. „Introduction to Transportation Planning“ by Bruton M.J., Hutchinson of London.
3. „Metropolitan Transportation Planning“ by Dicky, J.W., Tata McGraw Hill.
4. „Traffic Engineering and Transportation Planning“ by Kadiyali.L.R., Khanna Publishers, New Delhi
5. Lecture notes on UTP - Prof. S. Raghavachari ,R.E.C.Warangal.

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