COURSE STRUCTURE
AND
CURRICULUM FOR

UNDERGRADUATE DEGREE PROGRAM

BACHELOR OF TECHNOLOGY

(CIVIL ENGINGINEERING)

(w.e. from Academic Year 2019-20)

Faculty of Technology
DHARMSINH DESAI UNIVERSITY, NADIAD – 387001
(www.ddu.ac.in)

Sem.	Subject Code	Course Title	Subject Category	Department	Teaching Scheme					Examination Scheme				
					Th	Prac	Tut	Tot	Credits	Th Ext	Th Int	Prac	TW	Total
I	AF 111	Mathematics -I	Basic Sc.- Core	Maths	4	0	0	4	4.0	60	40	0	0	100
	AM 110	Engg. Economics & Principles of Management	Gen. - Elective	Mngment	3	0	0	3	3.0	60	40	0	0	100
	CT 112	Engineering Graphics	Engg Sc. - Core	Mechanical	4	3	0	7	5.5	60	40	25	25	150
	AF 122	Basic Electrical and Elecronics Engineering	Engg Sc. - Core	EC		2	0	6	5.0	60	40	25	25	150
	AF 117	Engineering Mechanics	Engg Sc. - Core	Civil	3	2	0	5	4.0	60	40	25	25	150
	CT 116	Elements of LINUX OS and C Programming -I	Engg Sc. - Core	EC	4	2	0	6	5.0	60	40	25	25	150
	AF 136	Workshop Practice-I	Engg Sc. - Core	Mechanical	0	2	0	2	1.0	0	0	0	50	50
					22	11	0	33	27.5	360	240	100	150	850
II	AF 201	Mathematics-II	Basic Sc.- Core	Maths	4	0	0	4	4.0	60	40	0	0	100
	ES 210	Environmental Sciences	Basic Sc.- Core	Chem./Core Sc.	3	0	0	3	3.0	60	40	0	0	100
	AX 215	Elements of Mechanical Engineering	Engg Sc. - Core	Mechanical	3	2	0	5	4.0	60	40	25	25	150
	AF 212	Electronics Principles	Engg Sc. - Core	EC	4	2	0	6	5.0	60	40	25	25	150
	AF 214	Mechanics of Solids	Engg Sc. - Core	Civil	3	2	0	5	4.0	60	40	25	25	150
	CT 215	C Programming -II	Inst. -Elective	EC	3	2	0	5	4.0	60	40	25	25	150
	AF 217	Workshop Practice-II	Engg Sc. - Core	Mechanical	0	2	0	2	1.0	0	0	0	50	50
					20	10	0	30	25	360	240	100	150	850
III	AF 301	Mathematics -III	Basic Sc.- Core	Maths	4	0	0	4	4.0	60	40	0	0	100
	CL 313	Structural Analysis - I	Program Core	Civil	4	0	2	6	6.0	60	40	0	25	125
	CL 314	Surveying -I	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
	CL 307	Fluid Mechanics - I	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
	CL 316	Engineering Materials	Inst. -Elective	Civil	3	0	0	3	3.0	60	40	0	0	100
	CL315	Construction Tech-I	Program Core	Civil	3	2	0	5	4.0	60	40	25	25	150
					22	6	2	30	27	360	240	75	100	775
IV	AF 411	Mathematics - IV	Basic Sc-Elective	Maths	4	0	0	4	4.0	60	40	0	0	100
	CL 413	Surveying-II	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
	CL 412	Structural Analysis -II	Program Core	Civil	4	0	2	6	6.0	60	40	0	25	125
	CL 411	Fluid Mechanics - II	Program Core	Civil	4	0	2	6	6.0	60	40	0	25	125
	CL 410	Railway Engg. & Town Planning	Program Core	Civil	4	0	0	4	4.0	60	40	0	0	100
	AF 410	Financial & managerial Accounting	Gen. - Elective	Mngment	3	0	0	3	3.0	60	0	0	40	100
					23	2	4	29	28	360	200	25	115	700
V	AF 501	Professional Communication-1	Gen. - Core	Language	1	2	0	3	2.0	50	0	50	0	100
	CL 513	Geotech and Applied Geology	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
	CL 514	Structural Analysis - III	Program Core	Civil	4	0	2	6	6.0	60	40	0	25	125
	CL 515	Planning & Architecture	Program Core	Civil	3	2	0	5	4.0	60	40	25	25	150
	CL 516	Design of Structures -I	Program Core	Civil	4	0	2	6	6.0	60	40	0	25	125
	CL 517	Concrete Technology	Program Core	Civil	3	2	0	5	4.0	60	40	25	25	150
					19	8	4	31	27	350	200	125	125	800
VI	AF 601	Professional Communication-2	Gen. - Core	Language	1	2	0	3	2.0	50	0	50	0	100
	CL 613	Soil Mechanics	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
	CL 614	Environmental Engineering	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
	CL 615	Water resources Engineering	Program Core	Civil	3	0	0	3	3.0	60	40	0	0	100
	CL 616	Design of Structures -II	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
		Elective-1	Program Elective	Civil	3	0	1	4	4.0	60	40	0	25	125
	CL 617	Conctruction Technology-II	Program Core	Civil	3	0	0	3	3.0	60	40	0	0	100
					22	8	1	31	27	410	240	125	100	875
VII	CL710	Irrigaton and Hydraulic Structures	Program Core	Civil	3	0	2	5	5.0	60	40	0	25	125
	CL711	Professional Practice & Valuation	Program Core	Civil	3	2	0	5	4.0	60	40	25	25	150
	CL712	Foundation Engg.	Program Core	Civil	4	0	2	6	6.0	60	40	0	25	125
	CL713	Construction Management & Economics	Program Core	Civil	4	0	0	4	4.0	60	40	0	0	100
	CL714	Highway Engineering	Program Core	Civil	4	2	0	6	5.0	60	40	25	25	150
		Elective -2	Program Elective	Civil	3	0	2	5	5.0	60	40	0	25	125
					21	4	6	31	29	360	240	50	125	775
VIII	AF 801	Industrial Training : Project		Civil	0	28	0	28	14.0	0	0	300	0	400
	AF 802	Seminar		Civil	0	8	0	8	4.0	0	100	0	100	100
					0	36	0	36	18	0	100	300	100	500
					149	85	17	251	209	2560	1700	900	965	6125

VI	Elective:1		
	1	CL 618	finite Element Method in Civil Engineering
	2	CL 619	Building Repairs and rehabilitation
	3	CL 611	Pre stressed concrete
	4	CL 620	Design of Hydraulic Structures

VII	Elective:2		
	1	CL 715	Earthquake Engineering
	2	CL 716	Project Planning and Control
	3	CL 717	Advanced Concrete Technology
	4	CL 718	Design of Special Structures

(AF111) MATHEMATICS - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	100	4	0	0	4

OBJECTIVES

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

DETAILED SYLLABUS

[1] DIFFERENTIAL CALCULUS

Applications of differential calculus to geometrical problems, equation of tangent & normal, angle between two curves, sub tangent, subnormal, length of tangent & length of normal, pedal equation, radius of curvature of plane curves in Cartesian, polar and parametric equations, radius of curvature at origin by Newton's method and by method of expansion.

[2] SUCCESSIVE DIFFERENTATION

Leibnitz's theorem, Maclaurin's theorem, Taylor's theorem, Applications to obtain expansion of functions.

[3] INTEGRAL CALCULUS

Curve Tracing, applications for finding area, length of arc, volume and surface area of solids of revolutions

[4] REDUCTION FORMULA

sinx dx, cosx dx, sinx cosx dx, tanx dx and cotx dx etc.

[5] BETA AND GAMMA FUNCTION

Definition, properties, relation between Beta and Gamma functions, use in evaluation of definite integrals

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[6] ELLIPTIC AND ERROR FUNCTIONS

Definitions and Properties and use in evaluation of definite integrals.

[7] FIRST ORDER DIFFERENTIAL EQUATIONS

Formation of differential equations, general and particular solution, equations of first order & first degree of the type variables separable, homogenous, reducible to homogenous, linear & exact and reducible to these forms. Application to geometrical and physical problems.

LEARNING OUTCOMES

- To answer at least about the convergence or divergence of integral when integral is not easily evaluated using techniques known.
- Able to evaluate the volume and surface area of the solid generated by revolving the solids by Integration.
- Apply the knowledge of differential equation to solve some practical problems such as electrical circuits, Newton's Law of cooling and problem related to orthogonal trajectories.
- Apply the knowledge of differentiation to obtain the series of function.
- Able to evaluate curvature of the given function.

TEXT / REFERENCE BOOKS

1) Engineering Mathematics-II, Shanti Narayan, S. Chand & Company Ltd
2) Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna publishers
3) Engineering Mathematics-I, Shanti Narayan, S. Chand & Company Ltd
4) Applied Mathematics, P. N. & J. N. Wartikar, S. Chand & Company Ltd
5) Engineering Mathematics-I, I. B. Prasad, S. Chand & Company Ltd

(AF122) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To expose the students to the concepts of various types of electrical, electronic and magnetic circuits and their applications.

DETAILED SYLLABUS

[1] FUNDAMENTALS OF CURRENTELECTRICITYANDDCCIRCUITS
Introduction, Computation of Resistance at constant temperature, Temperature dependence of Resistance, Computation of Resistance at different temperatures, Ohm's law statement, Illustration and limitation, Kirchhoff's laws-statement and illustration, Resistance in parallel and current division technique, Method of solving a circuit by Kirchhoff's laws.

[2] MAGNETIC CIRCUITS
Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits.

[3] ELECTROMAGNETICINDUCTION
Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance(L), Mutual Inductance(M), and Coupling coefficient between two magnetically coupled circuits(K), inductor in series.

[4] AC FUNDAMENTALS
Introduction, Waveform terminology, Concept of 3-phase emfgeneration, Root mean square (RMS) or effective value, Average Value of AC, Phasor representation of alternating quantities, Analysis of AC circuit.

[5] SINGLE PHASE ACCIRCUITS
Introduction, j operator, Complex algebra, Representation of alternating quantities in rectangular and polar forms, RL series circuit, RC series circuit, RLC series circuit, Admittance and its components, Simple method of solving parallel AC circuits, Resonance.

[6] ELECTRICAL MACHINES
Working principles of DC machine, Transformer, Three phase Induction Motor.

[7] DIODE THEORY
Semiconductor theory, Conduction in crystals, Doping source, The unbiased diode, Forward bias, Reverse bias, Linear devices, The diode graph, Load lines, Diode approximations, DC resistance of a diode.

[8] DIODE CIRCUITS
The sine wave, The transformer, The half wave rectifier, The full wave rectifier, The bridge rectifier, The capacitor input filter, Diode clipper and clamper circuit.

[9] SPECIAL PURPOSE DIODES

The Zener diode, The Zener regulator, Optoelectronic devices

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Analyze the various electric and magnetic circuits.
- Understand 1-phase and 3-phase supply terminology.
- Understand the effect of R, L and C in single phase ac circuit.
- Compare various diode circuits and rectifier circuits.
- Understand significance of resonance in series and parallel RLC circuit.
- Identify the various parts of electrical machines and their working.

TEXT / REFERENCE BOOKS

1) Basic Electrical, Electronics and Computer Engineering, R. Muthusubramanian, S. Salivahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill.
2) Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill.
3) Electrical Engineering, B. L. Theraja, 23rd Edition, S. Chand & Company Ltd.
4) Electrical Machines, B. L. Theraja, 23rd Edition, S. Chand & Company Ltd.

(CT116) ELEMENTS OF LINUX OS & C PROGRAMMING - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To understand the basic concepts of Linux OS and study the usages of Linux commands. Also understand the basics of C programming language.

DETAILED SYLLABUS

[1] BASICS OF OPERATING SYSTEM

[2] LINUX ARCHITECTURE
Kernel, shell and applications, Features of Linux, Basics of Command: Locating Commands, Types of Commands [Internal and External], Structure of Commands, Getting HELP: Commands like man, whatis, aprpos

[3] LINUX USAGE
Logging in to a Linux System, Switching between virtual consoles and the graphical environment, Changing your password, The root user, Editing text files.

[4] GENERAL PURPOSE UTILITY
cal, date, echo, bc, script, who, uname

[5] THE FILE SYSTEM
Linux File Hierarchy Concepts, Some Important Directories, Current Working Directory, File and Directory Names, Absolute and Relative Pathnames, Changing Directories, Listing Directory Contents, Copying Files and Directories, Moving and Renaming Files and Directories, Creating and Removing Files, Creating and Removing Directories

[6] THE FILE SYSTEM IN-DEPTH
Partitions and File systems, In odes and Directories, cp and in odes, mv and in odes, rm and in odes, Hard Links, Symbolic (or soft) Links, The Seven Fundamental File types, Checking Free Space, Mounting storage devices, Compressing and Archiving Files.

[8] FINDING AND PROCESSING FILES
locate, locate Examples, find, Basic find Examples, find and logical Operators, find and Permissions, find and Numeric Criteria, find and Access Times, Executing commands with find, find Execution Examples, The GNOME Search Tool.

[9] BASICS OF PROCESS

[10] TEXT EDITOR: VI

[11] SHELL PROGRAMMING
Scripting Basics, Creating Shell Scripts, Generating Output, Handling Input, Exit Status, Control Structures, Conditional Execution, File Tests, String Tests, for and sequences,

continue and break, Using positional parameters, handling parameters with Spaces, Scripting at the command line, Shell Script debugging.

[12] OVERVIEW OF C

[13] CONSTANTS, VARIABLES AND DATA TYPES

[14] OPERATORS AND EXPRESSIONS

[15] MANAGING INPUT OUTPUT OPERATIONS

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Familiar with Linux Operating System.
- Able to write a shell script.
- Understand C Language Basics.
- Able to implement C Codes.

TEXT / REFERENCE BOOKS

1) Unix : Concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill.
2) Programming in ANSI C, Balaguruswamy, 5th Edition, Tata McGraw Hill
3) Let Us C, Yashvant Kanetkar, 12th Edition, BPB Publication
4) Fundamental of Digital Circuits, Ashok N. Kamthane, 2nd Edition, Pearson Education

(CT112) ENGINEERING GRAPHICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	3	60	40	50	0	150	4	0	1.5	5.5

OBJECTIVES

- The course is aimed at developing basic graphic skills in preparation of basic drawings
- Developing skills in reading and Interpretation of engineering drawings to efficiently communicate ideas graphically
- To understand dimension and annotation two-dimensional engineering drawings
- To understand objects in two-dimensional views to improve visualization skills
- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional

DETAILED SYLLABUS

[1] ENGINEERING CURVES

Introduction to different curves & their applications, constructions of curves used in engineering such as Conics (Ellipse, Parabola, Hyperbola), Cycloidal curves (Cycloid, Epi-Cycloid, Hypo-Cycloid), Involutes, Archemedian spirals with tangents & normals.

[2] PROJECTIONS OF POINTS AND STRAIGHT LINES

Introduction to principal planes, Projections of points, Projections of Lines, construction for H.T. & V.T. Simple applications of projection of points and lines

[3] PROJECTIONS OF PLANES

Introduction to different types of planes, Projections of regular planes such as square, rectangle, triangle, circle, pentagon, hexagon, rhombus etc.

[4] PROJECTIONS OF SOLIDS

Introduction to different types of solids, Projections of Right &Regular Solids (Prisms, Pyramids, Cylinder and Cone)

[5] ORTHOGRAPHIC PROJECTIONS

First angle projection method and third angle projection method. Dimensioning techniques and methods, Conversion of pictorial views into Orthographic Projections with dimensions, Sectional orthographic projection, Orthographic vies with full and half section, special sections.

[6] ISOMETRIC PROJECTIONS

Introduction to Isometric planes, Isometric scale, Conversion of Orthographic views into Isometric Projections and views.

[7] DEVELOPLMENT OF SURFACES

Introduction, methods of development, Development of lateral surfaces of right regular solids (Prism, Cylinder, Pyramid and Cone)

TEXT / REFERENCE BOOKS

1) Engineering Drawing, N. D. Bhatt, Charotar Publication
2) Engineering Drawing Vol.1 & Vol. 2, P.J. Shah, S. Chand
3) Fundamentals of Engineering Drawing., Luzadder, Peachpit Press
4) A Text Book of Geometrical Drawing, P. S. Gill, S. K. Kataria Publications.
5) A Text Book of Machine Drawing, P. S. Gill, S. K. Kataria Publications

(AF136) WORKSHOP PRACTICE - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	50	0	50	0	0	1	1

OBJECTIVES

- Students belonging to all branches of engineering are made understand workshop layout, importance of various sections/shops of workshop, General safety rules and work procedure of work shop
- Students belonging to all branches of engineering are made understand importance or workshop practice in engineering and are given exposure to use practically by themselves of basic tools and equipment used for performing basic operations related to carpentry, tin smithy and plumbing individually.

DETAILED SYALLABUS

[1] INTRODUCTION TO WORKSHOP
Workshop layout, importance of various sections/shops of workshop, type of jobs done in each shop, General safety rules and work procedure of work shop

[2] TIN SMITHY (ONE JOB)
Tin smithy tools like –hammers, stakes, scissors etc. sheet metal operations such as shearing, bending, joining, safety precautions, demonstration of various operations

[3] CARPENTRY (ONE PRACTICE JOB AND ONE JOINT JOB)
Carpentry tools like –saw, planner, chisels, hammers, pallet, making gauge, vice, tee square, rule etc., carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining, type of woods and carpentry hardware, safety precaution, demonstration of various operations by using hardware

[4] PIPE FITTING (ONE JOB)
Pipe fitting tools, pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling etc. Types of various spanners such as flat, fix, ring box-adjustable etc, Safety precautions, demonstration of various operations.

LEARNING OUTCOMES

- After successful completion of this course, students belonging to all branches of engineering would be able to understand and able to use themselves of basic workshop tools used in carpentry, tin smithy and plumbing.

TEXT / REFERENCE BOOKS

1) Manual Developed by Mechanical Engineering Department.
2) Work shop technology, A. K. Hajrachaudhari& S. K. Hajrachaudhari, Media Promoters & Publishers
3) ITB Hand book, Engineering Industry training board

(AF124) ENGINEERING MECHANICS

Teaching Scheme			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	Lect	**Tut**	**Prac**	**Total**
3	0	2	60	40	25	25	150	3	0	2	4

A OBJECTIVES OF THE COURSE

- Comprehensive and theory-based understanding of the natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.

B DETAILED SYLLABUS

1 STATICS INTRODUCTION
Engineering And S.I. Units, Accuracy In Engineering Calculations, Vectors Composition And Resolution, Concept Of Rigid Body

2 CONCURRENT COPLANAR FORCE SYSTEM
Their Resultant Of A Force System Using Analytical As Well As Graphical Method

3 NON-CONCURRENT COPLANAR FORCE SYSTEM
Parallel And Non-Parallel Force System

4 EQUILIBRIUM OF FORCE SYSTEM
Concept of Internal Force, Free Body Diagram

5 FRICTION
Friction On An Inclined Plane, Ladder Friction, Wedge Friction, Screw Friction, Belt And Rope Drive

6 CENTRE OF GRAVITY
Lines, Plane Figures, Volumes, Bodies And Pappu's Theorems.

7 PRINCIPLE OF VIRTUAL WORK AND ITS APPLICATION

8 SUPPORT REACTION
Statically Determinate Beams, Types Of Beams, Types Of Supports

9 SIMPLE CASES OF CONCURRENT FORCE SYSTEM IN SPACE
Equation Of Static For Rigid Body Assemblies For General Force System

10 DYNAMICS:
Motion Of Connected Bodies, D'alemberts Principle

11 IMPACT
Momentum And Principle Of Momentum

12 INSTANTANEOUS CENTRE IN PLANE MOTION

13 WORK POWER AND ENERGY

14 MASS MOMENT OF INERTIA IN ROTATIONAL MOTION

15 VIBRATIONS OF SDOF SYSTEMS.

Term work: - Problems based on theory of engineering mechanics and Practical

C LEARNING OUTCOMES

- The students get knowledge of methods of analysis, Use scalar and vector analytical techniques
- Determine resultants and apply conditions of static equilibrium to plane force systems.
- Apply fundamental concepts of kinematics and kinetics of particles and rigid bodies to the analysis of simple and practical problems
- Solve problems in kinematic and dynamic systems
- A basic understanding of the laws and principles of mechanics.

D TEXT / REFERENCE BOOKS

1. Mechanics for Engineers, Beer and E. R. Johnston Jr., McGraw Hill Publication
2. Engineering Mechanics: Statics & Dynamics, A. K. Tayal, Umesh Publication
3. Engineering Mechanics, Khurmi, S. Chand
4. Engineering Mechanics, S. Ramamrutham, Dhanpatrai Publication
5. Mechanics, Russell Hibbeler, S. Chand

(AM-110) - ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT

Teaching Scheme			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	Lect	**Tut**	**Prac**	**Total**
3	0	0	60	40	0	0	100	3	0	0	3

A OBJECTIVES OF THE COURSE

- The need to understand the basics concepts of economics & management are important for the allocation of scarce resources of economy and proper utilization to generate the required products and services.
- Demand analysis and consumer behavior are the factors, which teach about the equilibrium price.
- Types of markets, product pricing and factor pricing leads to a better understanding of a particular product or service demanded by the consumers. Production cost and revenue analysis is important for operation of a profitable business.
- Monetary & fiscal policies are important for the understanding of consumption, government expenditure, investment, exports and imports.
- It also educates us about the ways in which the government generates revenue and handles its expenditure for a stable economy

B DETAILED SYLLABUS

1 Basic concepts and definitions:
Marshall, Robbins and Samuelson's definition of economics, Positive and normative economics, micro and macroeconomics, Utility, goods and services, Money and wealth, Consumer and Producer surplus

2 Demand analysis and consumer behavior:
Demand function, Law of demand, Elasticity of demand and its types, Price, income and cross-elasticity, Measures of demand elasticity, Factors of production, Advertising elasticity, Law of supply and demand, equilibrium between demand and supply

3 Markets, product pricing and factor pricing:
Concepts of perfect competition, Monopoly and monopolistic competition (meaning and characteristics), Control of monopoly, Price discrimination and dumping, Concept of Duopoly and Oligopoly, Kinked demand curve (price leadership model with reference to oligopoly)

4 Production cost & revenue analysis:
Production and production function, Short run & long run production function, Cost analysis, Various concepts of cost, Total fixed cost, total variable cost, Average fixed cost, average variable cost, average cost & marginal cost opportunity cost, Basic concepts of revenue, Relationship between average revenue and marginal revenue, Breakeven analysis meaning and explanation

5 Money:

Meaning, functions, types, monetary policy, Meaning, objectives, tools, fiscal policy, Meaning, objectives, tools, Banking; meaning, types, functions, central bank- RBI, it's function, concepts, Cash reserve ratio, bank rate, repo rate, reverse repo rate, statutory liquidity ratio, functions of central & commercial banks, inflation, deflation, stagflation, monetary cycles, new economic policy, liberalization, globalization, privatization, fiscal policy of the government.

Term work: Students will be required submit assignment based on topics covered in the syllabus such as calculation of breakeven point, demand analysis of a product or service, GDP, and inflation

C LEARNING OUTCOMES

- Students will understand the definitions of economics, micro & macroeconomics, utility, money, wealth, consumer and producer surplus
- Students will understand demand, function of demand, elasticity, factors of production, supply & demand equilibrium
- Students will understand types of markets, price discrimination, dumping and kinked demand curve
- Students will understand production, short & long run production function, cost analysis, fixed cost, variable cost, revenue, breakeven analysis
- Students will understand monetary policy, fiscal policy, banking, instruments of monetary policy, liberalization, globalization, privatization, role of government in policy making and business cycles

D TEXT BOOKS

1 Ahuja, H. L. Modern economics; S.Chand: New Delhi, 2002
2 Dewett, K. K. Modern economics theory; S Chand: New Delhi, 2006
3 Seth, M. L. Monetary economics; Lakshmi Narain Agarwal: Agra, 2018

E REFERENCE BOOKS:

1 Paneerselvam, R. Engineering economics; PHI publication: New Delhi, 2014
2 Robbins, S.; Decenzo, D. A. Fundamentals of management: Essential concepts and applications; Pearson education: New Jersey, 2015
3 Mankiw, N. G. Economics: Principles of economics; Cengage learning: USA, 2017
4 Williamson, T. R. Introduction to economics; D.C. Health & Company: Chicago, 1923

(AF201) MATHEMATICS – II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	100	4	0	0	4

OBJECTIVES

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

DETAILED SYLLABUS

[1] PARTIAL DIFFERENTIATION & ITS APPLICATIONS

Partial derivatives, Homogenous functions, Euler's theorem, Total derivatives - Differentiation of implicit functions, Change of variables, errors and approximations, Maxima & Minima of functions of two variables, Lagrange's method of undetermined multipliers.

[2] MULTIPLE INTEGRALS & THEIR APPLICATIONS

Double integrals, definition evaluation, change of order of integration, double integrals in polar co-ordinates, area enclosed by plane curves, Triple integrals, change of variables, volume of solids.

[3] INFINITE SERIES

Introduction, Definitions, Convergence, divergence and Oscillation of a series, P-test, Comparison test, Ratio test, Root test, Higher ratio test, Rabbe's test, Log test, Alternating Series, Leibnitz's rule.

[4] COMPLEX NUMBER

Definition, elementary operations, Argan's diagram, De-Moivre's theorem, and its applications to expand $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ respectively, To expand $\sin^n\theta$, $\cos^n\theta$ and $\sin^m\theta$. $\cos^n\theta$ in a series of Sines or Cosines of multiples of θ, Hyperbolic functions, Formulae of hyperbolic functions, Inverse hyperbolic functions, Logarithm of complex quantities. Separation of real and imaginary parts. C+iS method.

[5] LAPLACE TRANSFORMS

Introduction, Definition Transforms of elementary functions, properties of Laplace transforms, Inverse transforms, Note on partial fractions, Transforms of derivatives, Transforms of integrals. Multiplication and division by t, convolution theorem.

LEARNING OUTCOMES

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

- Obtain Laplace transform of standard Mathematical functions.
- Evaluate Partial Derivatives and apply the knowledge to solve some practical problems such has constrained optimization problems and other problems involving Partial Differentiation.
- Understand the concept of Multiple Integration and its applications viz. Area and Volume.

- Obtain the behavior of Infinite series.
- Evaluate Exponential, Trigonometric and Hyperbolic Functions of a complex number

TEXT / REFERENCE BOOKS

1) Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers, Delhi
2) Applied Mathematics for Engineers and Physicists, Pipes & Harvill, McGraw Hill Kogakusha Ltd.
3) Applied Mathematics, P. N. & J.N. Wartikar, Pune Vidyarthi Grih Prakashan

(AF212) ELECTRONIC PRINCIPLES

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To present a perceptive understanding of the fundamentals of a bipolar junction transistor and its application. Further, nurturing the ability to design and analyze the performance of transistor amplifier using different types of biasing techniques. Expose the students to the concepts of various types of digital circuit as well as concept of signal and systems.

DETAILED SYLLABUS

[1] BIPOLAR JUNCTION TRANSISTOR:
The unbiased transistor, The biased transistor, Forward-reverse bias, The CE connection, Transistor characteristics, The Base and Collector curves.

[2] TRANSISTOR FUNDAMENTALS:
DC load lines, Base bias, Emitter bias, The Operating Point, The Transistor switch.

[3] TRANSISTOR BIASING:
Voltage divider bias, VDB analysis, VDB load line, Two-supply emitter bias, other types of bias, PNP Transistors.

[4] AC MODELS:
Base biased amplifier, Coupling and bypass capacitors, The superposition theorem for amplifiers, AC resistance of the emitter diode, AC beta, The grounded emitter amplifier, The AC model of a CE stage, Introduction to h - Parameters & Comparison with T & PI models.

[5] VOLTAGE AMPLIFIERS:
Voltage gain, The loading effect of input impedance, Multistage amplifiers, Swamped amplifier.

[6] CC AND CB AMPLIFIERS:
The CC amplifier, the AC model of an Emitter Follower, Types of coupling, Direct coupling, Darlington connections.

[7] CLASS A AND B POWER AMPLIFIERS:
The AC load line of a CE amplifier, AC load lines of other amplifier, Class A operation.

[8] OSCILLATORS:
Theory of sinusoidal oscillation.

[9] FREQUENCY DOMAIN:
The Fourier series, The spectrum of a signal, Frequency spectrum of periodic signal

[10] FREQUENCY MIXING:
Nonlinearity, Medium-signal, operation with one sine wave, Medium signal operation with Two sine waves.

[11] AMPLITUDE MODULATION:
Basic idea, Percent modulation, AM spectrum, the envelope detector, the super heterodyne Receiver.

[12] DIGITAL CIRCUITS:
Number systems, Complements, Error detecting codes, Boolean algebra, Logic gate ICs, RTL & DTL logic circuits, and Simple Combinational circuits, Half adder, Full adder

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Analyse and designing of the various transistor amplifier circuits.
- Understand the importance of RE, RC, CB and CE in transistor circuit.
- Compare various biasing techniques and its importance in design of circuit.
- Understand significance of feedback in amplifier circuit.
- Build their notion about the digital electronics circuit and its applications.
- Gain the insight of the signal and its frequency spectrum for random signal.
- Understand the concept of the modulation and its application in wireless communication.

TEXT / REFERENCE BOOKS

1) Electronic Principles, Albert Malvino and David Bates, 7th Edition, Tata McGraw Hill.
2) Digital Electronics, Morris Mano, 3rd Edition, Prentice Hall of India
3) Electronic Devices and Circuit Theory, Robert Boylestad and Louis Nashelsky, 7th Edition, Prentice Hall of India.
4) Digital Electronics, Anand Kumar, Prentice Hall of India

(CT215) C PROGRAMMING - II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To implant the capability to develop logics which will help to create program, applications in C language.

DETAILED SYLLABUS

[1] ARRAYS
One-dimensional arrays, Multi-dimensional arrays, Dynamic arrays.

[2] CHARACTER ARRAYS AND STRINGS
String variables, Arithmetic Operations on Characters, Comparison of Strings, String handling functions, Table of String.

[3] USER-DEFINED FUNCTIONS
Need for user defined functions, A multi-function program, Elements of user defined function, Definition of functions, Return values and their types, Function calls, Function declarations, Functions with arguments, Function with multiple return values, Nesting of functions, Recursion, Passing arrays to functions

[4] STRUCTURES AND UNIONS
Introduction, Structures definition, Giving values to members, Structure initialization, Comparison of structure variables, Arrays of structures, Arrays within structure, Structure and function, Unions, Size of structures, Bit fields.

[5] POINTERS
Introduction, Understanding of pointers, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointers, Pointers expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Pointers on pointers, Pointer as function argument, Functions returning pointer, Pointers to functions, Pointers and structures.

[6] FILE MANAGEMENT IN C
Introduction, Defining and opening a file, Closing a file, Input/output operations on files, Error handling during I/O operations, Random access to files, Command line arguments.

[7] DYNAMIC MEMORY ALLOCATION
Allocating memory, Releasing the used space, Altering size of a block

[8] THE PREPROCESSOR
Macro substitution, File Inclusion, Compiler control directives

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Design, implement, test and debug programs that use arrays, character arrays, functions, structure, pointers.
- Describe and employ the strategies that are useful in dynamic memory allocation.
- Implement programming solutions using other features of the C language including recursion, macros, and compiler control directives.

TEXT / REFERENCE BOOKS

1) Programming in ANSI C, Balaguruswamy, 5th Edition, Tata McGraw Hill.
2) Let Us C, Yashvant Kanetkar, 12th Edition, BPB Publication.
3) Programming in C , Ashok N. Kamthane, 2nd Edition, Pearson Education
4) The C Programming Language, Kernighan and Ritchie, 2nd Edition, PHI Learning

(AF214) MECHANICS OF SOLIDS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

OBJECTIVES

- The objective of this course is to make the students understand the concept of stress and strain under different type loading conditions and different types of structures.
- Understanding of basic knowledge of maths and physics to solve real-world problems and to analyse simple problems in solid mechanics

DETAILED SYLLABUS

[1] SIMPLE STRESSES AND STRAINS

Introduction, stress, strain, tensile, compressive and shear stresses, Elastic limit, Hooke's law, Poisson's Ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus, Bars of Varying sections, Extension of tapering rods, Bars of uniform strength, temperature stresses, Hoop stress, stress on oblique sections, State of simple shear, Relation between Elastic constants

[2] MECHANICAL PROPERTIES OF MATERIALS

Ductility, Brittleness, Toughness, Malleability, Behaviour of ferrous and nonferrous metals in tension and compression, shear and bending tests, Standard test pieces, Influence of various parameters on test results, True and nominal stress, Modes of failure, Characteristic stress-strain curves, Strain hardening, Hardness, Different methods of measurement, Izod, Charpy and tension impact tests, Fatigue, Creep, Correlation between different mechanical properties

[3] BENDING MOMENT AND SHEAR FORCE

Bending moment, shear force in statically determinate beams subjected to uniformly distributed, concentrated and varying loads. Relation between bending moment, shear force and rate of loading

[4] MOMENT OF INERTIA

Concept of moment if Inertia, Moment of Inertia of plane areas, polar moment of Inertia, Radius of gyration of an area, Parallel Axis theorem, Moment of Inertia of composite Areas, product of Inertia, Principal axes and principal Moments of Inertia

[5] STRESSES IN BEAMS

Theory of simple bending, bending stresses, moment of resistance, modules of section, Built up and composite beam section, Beams of uniform strength, Distribution of shear stress in different sections

[6] TORSION

Torsion of circular. solid and hollow section shafts, shear stress angle of twist, torsional moment of resistance, power transmitted by a shaft, keys and couplings, combined bending and torsion, close coiled helical springs

[7] STRESSES IN CYLINDRICAL AND SPHERICAL SHELLS UNDER FLUID PRESSURE

[8] INELASTIC BENDING OF BEAMS

[9] PRINCIPAL STRESSES AND STRAIN

TERM WORK

PROBLEMS BASED ON THEORY OF ENGINEERING MECHANICS AND PRACTICAL

LEARNING OUTCOMES

The students get knowledge of

- Solve practical problems through evaluating the relationship between stress and strain
- Generate and sketch shear force and bending moment diagrams
- Derive and apply stress and strain relationships in single and compound members subject to axial force, bending moment and torsion
- Analysis of composite beams and shafts

TEXT / REFERENCE BOOKS

1) Strength of Materials, S. Ramamrutham, Dhanpatrai Publication
2) Strength of Materials, Sadhu Singh, Dhanpatrai Publication
3) Mechanics of Solid, R. S. Khurmi, S. Chand
4) Introduction to Solid Mechanics, Shames and Pitarresi, S. Chand
5) Strength of Materials , S. S. Bhavikatti, S. Chand
6) Mechanics of Solids **,** Stephen H. Crandall**,** S. Chand

(AF215) HEAT POWER

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- Students belonging to all branches of engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical processes and basic equipment like boilers, compressors, I.C. engines, refrigeration and air conditioning etc.

DETAILED SYLLABUS

[1] PROPERTIES OF STEAM

Distinction between gas and vapour, sensible heat, latent heat, total heat and super heat of steam, condition of steam, dryness fraction, methods of determination of dryness fraction, internal energy of steam, specific volume, critical pressure and temperature.

[2] PROPERTIES OF GASES

Zeroth, first and second laws of thermodynamics, laws of perfect gases(Boyle's law, Charle's law, Regnault's law, Joule's law), Characteristic equation of gas, gas constants, internal energy, specific heat at constant pressure and specific heat at constant volume, relationship between specific heats, thermodynamic processes of perfect gases.

[3] FUELS & COMBUSTION

Solid, liquid and gaseous fuels used for boilers and I.C. engines, combustion of fuels, air required, products of combustion of fuel, analysis of flue gases, calorific value of fuels and its determination.

[4] BOILERS

Classification of boilers, Cochran & Babcock-wilcox boiler, boiler mountings and accessories, draught (Natural & Artificial).

[5] I. C. ENGINES

Prime movers, classification of prime movers with examples of each classes, advantages of I.C. engines over E.C. engines, classification of I.C. engines, thermodynamic air cycles (Carnot cycle, Constant volume auto cycle, Constant pressure Joule cycle, Diesel cycle), Air standard efficiency, construction and working of 2–stroke and 4–stroke cycle engines, P-v diagrams, determination of I.P., B.P., fuel supply in I.C. engines, ignition system of I.C. engines, Cooling of I.C. engines, Lubrication & governing of I.C. engines.

[6] SOLAR ENERGY

Introduction to solar energy systems.

TERM WORK

Term – work shall be based on the above syllabus

TEXT / REFERENCE BOOKS

1) Elements of Heat Engines (S.I. Units) , Vol: 1, By: R. C. Patel & C. J. Karamchandani, Publisher: Acharya Book Depo
2) Elements of Heat Engines (S.I. Units), By: N. C. Pandya & C. S. Shah, Publisher: Charotar Publishing house
3) Heat Engine, By: P. L. Ballaney, Khanna Publishers
4) A Course in Thermodynamics and Heat Engines, By: Kothandraman, Dhanpatrai Publication

(CT217) ELECTRONICS WORKSHOP

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	50	0	50	0	0	1	1

OBJECTIVE

- To understand the basic components of electrical and electronic circuit. To understand the various electronics software and its application.

DETAILED SYLLABUS

Digital Multi-meter, Power Supply, Function Generator, Cathode Ray Oscilloscope, Digital Oscilloscope, Measurement of Phase Difference in single phase circuit, Various Electrical and Electronics component like LED, LDR, Photodiode, MOSFET, MCB and Relay. Various Ports,

Cables and Connectors like RJ45, RS232 and CRO probe. Multisim - Circuit Simulator Software,

Printed Circuit Board Designing Software – Proteus, PCB Manufacturing Process, Soldering and De-soldering of circuit and component on PCB, Open Circuits /Short Circuit Testing on PCB.

Linux Installation Steps and Projects.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand different types of basic electrical and electronic components.
- Analyze the various electronics circuit using software.
- Design the PCB layout of various electronics circuit.
- Identify and design various types of cable and connector.

TEXT / REFERENCE BOOKS

1) Essentials of Electronic Devices, Thomas L. Floyd, Edition 4th, Charles E. Merrill
2) Electronic Principles, Albert Paul Malvino and David J. Bates, Edition 7th, Tata McGraw-Hill
3) Electronic Components and Materials Principles, Dr.Madhuri A Joshi, Edition 2nd, Shroff Publishers & Distributors PVT. LTD.
4) Fundamentals of Electrical Engineering and Electronics, B. L. Theraja, Edition 1st, S. Chand & Company Ltd

(AX215) ELEMENTS OF MECHANICAL ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- Students belonging to all branches of engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical processes and basic equipment like boilers, compressors, I.C. engines, refrigeration and air conditioning etc.

DETAILED SYLLABUS

[1] INTRODUCTION

Systems of units, Pure and working substance, properties of substance, energy, thermodynamic system, surroundings and system boundary, Path and point functions, Thermodynamic equilibrium, law of conservation of energy, Specific heat capacity, thermodynamic process and cycle

[2] PROPERTIES OF STEAM

Distinction between gas and vapour, Steam formation, Sensible heat, Latent heat, Total heat and super heat of steam, Condition of steam, Dryness fraction, Properties of steam i.e. Enthalpy, Internal energy, Density and Specific volume, Critical pressure and temperature of steam, External work of evaporation and internal latent heat. Combined separating and throttling calorimeter

[3] PROPERTIES OF GASES

Zeroth, first and second laws of thermodynamics, laws of perfect gases (Boyle's law, Charle's law, Regnault's law, Joule's law), Characteristic equation of gas, gas constants, internal energy, specific heat at constant pressure and specific heat at constant volume, relationship between specific heats, thermodynamic processes of perfect gases (constant volume, constant pressure, constant temperature, isentropic and polytropic)

[4] FUELS AND COMBUSTION

Introduction, Classification of Solid fuels, Liquid Fuels, Gaseous fuels, LPG, CNG and bio fuels, Calorific values, Combustion of fuels, Minimum air required for combustion of fuels

[5] REGRIGERATION AND AIR CONDITIONING

Introduction, Evaporation, Refrigerating effect, Unit of refrigeration and COP, Important refrigerants, Refrigerating systems i.e. Air refrigerating system, Ammonia absorption refrigerating system and Vapour compression refrigerating system, Analysis of vapour compression refrigeration system, i.e. COP, mass flow rate, heat rejected from condenser, power consumption etc. Window and split air conditioners: principles and working

[6] BOILERS

Introduction, Classification, Cochran & Babcock-Wilcox boiler, Evaporation in boiler, Equivalent evaporation, Boiler efficiency, functioning of boiler mountings and accessories. Boiler draught, Classification and comparison of boiler draught systems

[7] I. C. ENGINES

Prime mover and its classification, advantages of I.C. engines over E.C. engines, classification of I.C. engines, thermodynamic air cycles i.e. Carnot cycle, Constant volume OTTO cycle and Diesel cycle, Air standard efficiency, construction and working of 2–stroke and 4–stroke cycle engines, p-v diagrams, I.C. engine performance. Calculations of Indicated power, brake power, efficiencies, specific fuel consumption

[8] AIR COMPRESSORS

Introduction, Classification, Working of reciprocating air compressors, air compressor terminology, Work of compression, Reciprocating compressor efficiency, Introduction and classification of rotary air compressors, Comparison between reciprocating and rotary compressor**.**

LEARNING OUTCOMES

After successful completion of this course, students belonging to all branches of Engineering would be able to understand fundamental aspects related to important mechanical processes and basic equipment like boilers, compressors, I.C. engines etc.

TEXT / REFERENCE BOOKS

1) Elements of Heat Engines (S.I. Units) Vol. 1, R. C. Patel & C. J. Karamchandani, Acharya Book Depot, Vadodara
2) Elements of Mechanical Engineering, A. V. Mehta, Everest publishing house, Pune
3) Elements of Mechanical Engineering, P. S. Desai & S. B. Soni, AtulPrakashan, Ahmedabad
4) Heat Engine, P. L. Ballaney, Khanna Publishing Company
5) A course in Thermal Engineering, Domkundwar, S and Kothandaraman, C. P., Dhanpat Rai and Sons

(ES210) ENVIRONMENTAL SCIENCE

Teaching Scheme			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut		Total
4	0	0	60	40	0	0	100	4	0	0	4

A OBJECTIVES OF THE COURSE

- The objective for this course is to bring awareness about sustainable development is a key to the future of mankind.
- Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues.
- Managing environmental hazards have become very important. It is now even more critical than ever before for mankind as a whole to have a clear understanding of environmental concerns and to follow sustainable development practices.

B DETAILED SYLLABUS

1 THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance & Need for public awareness

2 NATURAL RESOURCES RENEWABLE AND NON-RENEWABLE RESOURCE

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

3 Ecosystems

Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem • Ecological succession, Food chains, food webs and ecological pyramids • Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

4 Biodiversity and its conservation

Introduction definition: Genetic, species and ecosystem diversity • Bio-geographical classification of India • Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels • India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India • Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

5 Environmental Pollution

Definition, Causes, effects and control measures of: • Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards • Solid waste management, causes, effects and control measures of urban and industrial wastes • Role of an individual in prevention of pollution, Pollution case studies • Disaster management: floods, earthquake, cyclone and landslides

6 Social issues and the environment

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

7 Human Population and the Environment

Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education• HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health • Case studies

8 Field work

Visit to a local area to document environmental assets river/forest/grassland/ hill/mountain), Visit to a local polluted site urban/Rural/Industrial/ Agricultural , Study of common plants, insects, birds, Study of simple ecosystems – pond, river, hill, slopes etc.

Teamwork : Students will be required submit assignment based on field work related to biodiversity of the ecosystems, waste management, environmental pollution, and social issues of environment.

C LEARNING OUTCOMES

- The meaning of environment, ecology, ecosystems, biotic & abiotic components, food chains & webs
- Natural resources, biodiversity, hotspots, threats to biodiversity

- Factors causing environmental pollution, prevention of pollution, role of an individual in pollution control & abatement and disaster management

- Social issues related to environmental science, water conservation, rain water harvesting, environmental ethics, climate change, wasteland reclamation, consumerism and waste products, environment protection act and public awareness

- Issues of population growth, population explosion, human health and rights

- Field work related to ecosystems, polluted sites, and species
- After completion of this course students will be able to understand:

D **Text Books:**

Erach Bharucha Textbook of Environmental Studies; Second Edition, Universities Press: Hyderabad, 2013.

Poonia, M. P.; Sharma, S. C. Environmental studies; Khanna Publishing House: New Delhi, 2017.

Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015

E **REFERENCE BOOKS:**

1 Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany, 2013.

2 Basak, A. *Environmental Studies*; Dorling Kindersley: India, 2009.

3 Dhameja, S. K. *Environmental studies*; S. K. Kataria and Sons: New Delhi, 2007.

4 Rao, C. S. *Environmental Pollution Control Engineering*; Wiley publishers: New Delhi, 2006.

5 Brunner, R. C. *Hazardous Waste Incineration*; McGraw Hill: Michigan, 1989.

6 Clark, R. S. *Marine Pollution*; Clanderson Press Oxford: Bath, 2001.

7 Trivedy, R. K. *Handbook of Environmental Laws, Acts, Guidelines, Compliances & standards*; B. S. publications: Hyderabad, 2005.

8 Jadhav, H.; Bhosale, V. M. *Environmental Protection and Laws*; Himalaya Pub. House: Delhi, 1995.

9 Agarwal, K. C. *Environmental Biology*; Nidi Publ.: Bikaner, 2001.

10 Bharucha, E. *The Biodiversity of India*; Mapin Publishing: Ahmedabad, India, 2002.

11 Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., *Environmental Encyclopedia;* Jaico Publ. House: Mumbai, 2001.

12 De, A. K. *Environmental Chemistry;* Wiley Eastern: New Delhi, 2006.

13 Gleick, H. P. Water in crisis, Pacific Institute for Studies in Dev., *Environment & Security*; Stockholm Env. Institute Oxford Univ. Press: New York, 1993.

14 Hawkins, R.E., *Encyclopedia of Indian Natural History*; Bombay Natural History Society: Bombay, 1987.

15 Heywood, V. H.; Waston, R. T. *Global Biodiversity Assessment;* Cambridge Univ. Press: Cambridge, 1995.

16 Mckinney, M.L.; School, R.M. *Environmental Science systems & Solutions*; Web enhanced edition: USA, 1996.

17 Miller, T.G. Jr.; Spoolman, S. E. *Environmental Science*; Cengage learning: Wadsworth, 2014.

18 Odum, E.P. *Fundamentals of Ecology*; W.B. Saunders: USA, 1971.
19 Rao, M. N.; Datta, A.K. *Waste Water treatment*; Oxford & IBH Publ.: New Delhi, 1987.
20 Sharma, B. K., *Environmental Chemistry*; Goel Publ. House: Meerut, 2001.
21 Townsend, C., Harper, J.; Michael, B. *Essentials of Ecology*; Blackwell: Oxford, 2008.
22 Trivedi, R. K., *Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards*, Vol I and II; B. S. Publications, Hyderabad, 2010.
23 Trivedi, R. K.; Goel, P. K. Introduction to air pollution; ABD Publishers: Jaipur, 2003.
24 Wanger, K. D., *Environmental Management;* W.B. Saunders Co. Philadelphia, USA, 1998.

(AF301) MATHEMATICS III

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	-	-	100	4	-	-	4

OBJECTIVES OF THE COURSE

- Ability to analyse and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics.
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as rules, and justify or prove them.

DETAILED SYLLABUS

1. **FOURIER SERIES:**
   Euler's Formulae, condition for a Fourier expansion, functions having points of discontinuity, change of interval, odd & even functions, Expansion of odd & even period ic functions, Half-range series, practical harmonic analysis.

2. **INTEGRAL TRANSFORMS:**
   Definition, Fourier integral, Fourier sine & cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier sine & cosine transforms, finite Fourier sine & cosine transform, Fourier transform of the derivative of a function, Inverse Laplace transform by method of residues, Application of transforms to boundary value problems.

3. **NUMERICAL METHOD:**
   Solution of algebraic and transcendental equations, by Newton - Raphson method, Direct iteration method, false position method, Solution of linear simultaneous equation :(1) Gauss - elimination (2) Gauss - jordan (3) Gauss - siedal method , Numerical methods to solve first order and first degree ordinary differential equations by Picard's method &Taylor's series method, Modified Euler's Method, Milne's Method, Runge's method, Runge kutta method.

4. **ORDINARY DIFFERENTIAL EQUATIONS:**
   Formation of differential equations, general and particular solution, equations of first order & first degree of the type variables separable, homogenous, reducible to homogenous, linear & exact and reducible to these forms. Application to geometrical and physical problems.
   Linear differential equations of higher order with constant coefficients, equations reducible to linear equations with constant coefficients, Simultaneous linear equations with constant coefficients. Application to engineering problems. Series solution of differential equations of the second order with variable coefficients

5. **PARTIAL DIFFERENTIAL EQUATIONS:**
   Introduction, formation, linear equation of first order, non-linear equations of first order-Charpit's method, homogenous linear equations with constant coefficient to find the complementary functions & the particular integral, non-homogenous linear equations with constant coefficients. Method of separation of variables - vibrating string problem, Heat flow equation etc.

6. **LAPLACE TRANSFORMS:**
   Application to differential equation, simultaneous linear equation with constant coefficients.

LEARNING OUTCOMES:

At the end of the course students are able to

- Obtain Fourier series of a periodic function into the sum of a (possibly infinite) set of simple oscillating functions, namely sines and cosines.
- Model physical processes using partial and ordinary differential equation and it can be solved analytically as well numerically.
- Solve basic initial value problems, directly without determining a general solution with the help of Laplace Transformation.
- Characterize the solutions of a differential equation with respect to initial values and analyze the behavior of solutions.
- Use numerical methods to find an approximate solution of algebraic and transcendental equations using appropriate method.
- Solve wave and heat equation.

RECOMMENDED TEXTBOOKS:

1. Higher Engineering Mathematics, Dr. B.S.Grewal

REFERENCE BOOKS:

1. A Text Book of Applied Mathematics, P.N. & J.N. Wartikar
2. Mathematics for Engineering, Chandrika Prasad
3. A Text Book ofengineering Mathemetics, Dr. K.N.Srivastva & G.K.Dhawan

(CL307) FLUID MECHANICS I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES OF THE COURSE

- The objectives of the course are
  To explain basic principles of fluid mechanics to the students.
- To explain hydrostatic forces acting on different surfaces
- To explain the concept of buoyancy and flotation
- To explain various devices used for fluid measurement

DETAILED SYLLABUS

1. **INTRODUCTION** **[04]**
   (a) Introductory Concepts and Definitions: Fluids and Soils; Liquid, Gas and Vapour; Coordinate systems, Continuum; Control volume. (b) Properties of Fluids: Density; Specific weight; Specific Volume; Specific Gravity; Bulk modulus of Elasticity; Pressure; Viscosity; Surface Tension; Capillarity.

2. **FLUID STATICS** **[12]**
   (a) Fluid Pressure and It's measurement: Introduction; Variation of static pressure; Atmospheric, Gauge and Absolute Pressure; Hydrostatic Paradox; Pressure measurement by different devices; Hydraulic press. (b) Hydrostatic Force: Pascal's Law; Hydrostatic force on submerged plane and curved surfaces; Location of Hydrostatic force; Applications of Hydrostatic force. (c) Buoyancy: Archimedes' Principle; Buoyant force; Determination of metacentric height; Stability of floating bodies.

3. **FLUID KINEMATICS** **[07]**
   (a) Fundamentals of Fluid Flow: Introduction; Methods of describing fluid motion; Velocity and acceleration of a fluid particle; Types of fluid flow; Streamline, Path line and Streak line; Existence of flow; Rotational and irrotational flow; circulation and vorticity; continuity equation in Cartesian coordinates in one - dimensional and three-dimensional form; continuity equation in polar coordinates; stream function and velocity potential function : relationship between these functions in Cartesian and polar coordinates; flow nets. Vortex Motion.

4. **FLUID KINETICS** **[07]**
   Equation of motion and energy equation: , Forces acting on fluid in motion; Euler's equation of motion for one - dimensional and 3- dimensional flow; Bernoulli's equation from Euler's equation of motion; Application of Bernoulli's equation.

5. **FLUID FLOW MEASUREMENT** **[09]**
   Measurement of discharge through a pipe by Venturimeter, Orificemeter, Orifice, Mouthpiece, Rotameter and velocity measurement by Pitot Tube. Measurement of discharge through an Open Channel by a Weir, and Notch; Time of emptying a tank through orifice; Weir and Notch.

6. **FLOW THROUGH PIPES** **[09]**

Introduction; Types of flow; Reynolds's experiments; Darcy - Weisbach formula, Chezy's formula, Manning's formula; Laws of Fluid Friction; Frictional loss: Other Minor losses in pipe flow; Total Energy Line and Hydraulic Gradient Line; Power transmission through pipes; Pipes in series and Equivalent pipe; Pipes in parallel; Branched pipe; Water hammer phenomena in pipe flow; Loss of head due to friction in tapering pipe; Loss of head due to friction in a pipe with side tapings. Steady flow in conduits: Network of pipes and its hydraulic analysis by Hardy Cross method; Syphon and Rising Mains.

COMPUTER APPLICATIONS TO SPECIFIED PROBLEMS.

LEARNING OUTCOMES

- On the completion of the course, one should be able
  To understand various types of fluid properties and their use in fluid mechanics.
- To understand various types of hydrostatic forces acting on different types of hydraulic structures such as dams, spillways, lock gates etc.
- To understand the concepts of buoyancy and flotation and its practical utility.
- To calibrate fluid flow measuring devices like venturimeter, orifice meter, notches, orifice, mouthpieces.
- To understand various types of flow measuring devices and their practical utility.
- To understand the concepts of pipe flow and its practical utility.

RECOMMENDED TEXTBOOKS

1. Fluid Mechanics, by R K Bansal; Laxmi Publications
2. Fluid Mechanics by A K Jain, Khanna Publishers, New Delhi

REFERENCE BOOKS

1. Fluid Mechanics by R.K.Rajput, S. Chand & Co. publications
2. Fluid Mechanics & Hydraulic Machines by P.N.Modi and S.N.Seth, Standard Book House
3. Fluid Mechanics and Machinery by H M Raghunath, CBS Publishers
4. Fluid Mechanics by D.S. Kumar, S.K. Kataria & Sons
5. Fluid Mechanics, by V L Streeter, and E B Wylie, McGraw Hill, 1985, New York
6. Theory and Applications of Fluid Mechanics by K. Subramanya, Tata-McGraw Hill Publishing Co., 1993, New Delhi
7. Introduction to Fluid Mechanics, SI edition, 2005 by E.J. Shaughnessy, I.M. Katz, and J.P. Schaffer, Oxford University Press, New Delhi
8. Fluid Mechanics by F.M. White, McGraw Hill, New York
9. Engineering Fluid Mechanics by R.J. Garde, and A.C. Mirajgaoker, New Chand & Sons
10. **Web Materials:**
    1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/fluid_mechanics/index.htm
    2. http://nptel.iitm.ac.in/video.php?subjectId=105101082
    3. http://nptel.iitm.ac.in/courses/IIT-MADRAS/Hydraulics/index.php
    4. http://nptel.iitm.ac.in/video.php?subjectId=105103096

LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Experiment No.	Name of Experiment
1.	Study of various pressure measurement devices
2.	Determination of force of buoyancy on different objects
3.	Experimental determination of metacentric height of a floating body
4.	Drawing a flow net
5.	Reynold's experiment
6.	Determination of loss of head due to friction in a pipe
7.	Verification of Bernoulli’s theorem
8.	Flow Measurement through Notch
9.	Determine Hydraulic coefficients of a circular orifice.
10.	Flow Measurement through Venturimeter

(CL313) STRUCTURAL ANALYSIS I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	2	0	60	40	25	0	125	4	2	0	6

OBJECTIVES OF THE COURSE

- To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary determinate structures

DETAILED SYLLABUS

1. **FORCES IN DETERMINATE PIN JOINTED TRUSSES:** **[09]**
   Different types of pin jointed trusses, Analysis of trusses using (i) Method of Joints (ii) Method of Sections (iii) Graphical Method.

2. **STRAIN ENERGY** **[03]**
   Resilience, Strain Energy in Tension Compression, Bending and Torsion, Proof Resilience, Impact Loads.

3. **STRENGTH THEORIES** **[02]**
   Different Theories of Elastic Failure and their Applications

4. **SLOPE AND DEFLECTION OF STATICALLY DETERMINATE BEAMS** **[14]**
   Differential Equation of the Elastic Curve, fundamental Double Integration Method, Macaulay's Method, Moment Area Method, Conjugate Beam Method, Unit Load Method and Castigliano's First Theorem.

5. **DIRECT AND BENDING STRESSES** **[03]**
   Short Columns subjected to eccentric load, Middle Third Rule, Kernal (Core) of Section

6. **COLUMNS AND STRUTS** **[05]**
   Buckling of Columns, different end conditions, effective length, least radius of gyration, Euler's Theory of Long Columns – its applicability and limitations, Rankine's Formula, Secant Formula

7. **UNSYMMETRICAL BENDING** **[04]**
   Unsymmetrical Bending, Z – Polygon, Shear Centre.

8. **INFLUENCE LINES** **[08]**
   Statically Determinate Beams – I.L. for Support Reaction, Shear and bending moment for UDL and several Point Loads. Criteria for maximum effect.
   Statically Determinate Trusses – I.L. for Forces in members for UDL and Point Load Application of ILD for the structural analysis problem
   Term Work shall consist of Graphical and/or analytical problems based on all the topics of the syllabus of Structural Analysis – I

LEARNING OUTCOMES

The students have the advanced knowledge of methods of analysis for determinate simple structures.After successful completion of the course, student will be able to,

- Apply principles of statics to determine reactions & internal forces in statically determinate structures.
- Determine displacements of statically determinate structures.
- Determine stresses due to axial & eccentric loading.
- Determine buckling load for columns & struts with different end Conditions
- Determine strain energy stored in a body.

RECOMMENDED TEXTBOOKS

1. Applied Mechanics by S. B. Junnarkar and H. J. Shah, Charotar Publication
2. Strength of Materials by Ramamrutham

REFERENCE BOOKS

1. Strength of Materials by B.C.Punmiia
2. Structural Analysis by Hibbler R C; Pearson Education
3. Structural Analysisby Aslam Kassimali, Cenage Learning
4. Devdas Menon Structural Analysis by Devdas Menon, Narosa Publications
5. Structural Analysis by Hibbeler, Pearson Education
6. Theory of Structures by Timoshenko S.P.& Young D.H, McGraw Hill
7. Fundamentals of structural Mechanics and analysis by M.L. Gambhir,, Printice Hall India

(CL314) SURVEYING I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES OF THE COURSE

- To develop concepts of various types of land surveying and prepare and interpret maps and drawing.

DETAILED SYLLABUS

1. **INTRODUCTION** **[02]**
   Introduction to Surveying. Classification of Surveys and Classification of Surveying.

2. **MEASUREMENT OF DISTANCES** **[05]**
   Chain and Tape Survey, Standard Metric Chains, Methods of Chaining, Instruments used for taking offsets, Correction for Sloping Ground, Obstacles in Horizontal Distance measurement, Field Works, Plotting, Conventional Signs, Degree of Accuracy.

3. **COMPASS SURVEYS** **[08]**
   Magnetic Compass - Principles, Procedures, Precautions and Corrections; Traverse with Prismatic Compass.

4. **LEVELLING** **[07]**
   Dumpy, Tilting and Automatic Levels, Staves - Methods of Leveling, Precautions and Corrections, Level Field Book, Plotting and Contouring.

5. **THEODOLITE** **[08]**
   Transit Theodolite- Uses, Temporary Adjustments, Measurement of Vertical and Horizontal Angles, Theodolite Traverse, Latitude and Departure, Balancing.

6. **MINOR INSTRUMENTS** **[03]**
   Principles and Uses of Planimeter, Abney Level, Tangent, Clinometers, Box Sextant, Pantograph

7. **PLANE TABLE SURVEY** **[04]**
   Instruments, Adjustments, Methods of Plane Tabling, Errors, Accuracy and Advantages

8. **SETTING OUT WORKS FOR BUILDING AND ALIGNMENTS OF BRIDGE, TUNNEL, AND DAM** **[03]**
   Practical, Sectional Work and Term-Work shall be based on the course under Surveying-II

LEARNING OUTCOMES

- Students are expected to use all surveying equipment, prepare longitudinal section& Cross Section as well as contour maps and carryout surveying works related to land and civil engineering projects.

REFERENCE BOOKS

1. Surveying Volume-1 by S K Duggal, Tata McGraw Hill Publication
2. Fundamentals of Surveying by S K Roy, PHI Learning Pvt. Ltd Publication
3. Surveying & Levelling by S C Rangwala, Charotar Publication House
4. Surveying & Leveling by N N Basak, Tata McGraw Hill Publication

LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Experiment No.	Name of Experiment
1.	Perform ranging and tapping operations in different field conditions and use of EDM
2.	Study of Surveyor Compass & Prismatic Compass; and Measurement of bearings of lines for given traverse.
3.	Perform temporary adjustments of Dumpy level; Take and record the level reading in the level book and Determine Reduced level using Rise & Fall method and Height of line of collimation method by applying checks
4.	Carry out fly levelling using Auto level in different field conditions.
5.	Introduction to plane table survey with accessories and methods of orientations.
6.	Various methods of plane table survey.
7.	Study of Transit Theodolite; measurement of horizontal angle by repetition method for a given closed traverse.
8.	Measurement of area of figure with irregular boundary by Planimeter.
9.	**List of Projects:** 1. Theodolite traverse survey project 2. Profile levelling and contouring survey project 3. Plane table survey project

(CL315) CONSTRUCTION TECHNOLOGY I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
3	0	2	60	40	25	25	150	3	0	1	4

OBJECTIVES OF THE COURSE

- To make the students aware of the various techniques and practices on various stages of building construction and careful selection of suitable construction components & To learn current building drawing practices for various building Components.

DETAILED SYLLABUS

1. **Introduction** [02]
   Classification of buildings, Components of buildings and their broad functions, Types of building & Building system, Frame structure, Load bearing, Steel Structure etc.

2. **Foundation** [07]
   Open excavations, braced excavations, Functions, Classification, suitability and constructional features of shallow foundations, building foundation in black cotton soil, machine foundation, failure of building foundation, constructional features and suitability of pile foundations used for buildings, Damp proofing in building construction, Underpinning

3. **Masonry** [06]
   Technical terms used in masonry, design concepts, Classification and construction features of common stone masonry, principles of brick masonry construction, bonds in brick masonry, construction of reinforced brick masonry and partition walls used in buildings, design concepts and construction details of Arches & lintels

4. **Flooring** [04]
   Type of flooring and its suitability, Construction details of CC/RCC flooring, Tile floorings (mosaic, glazed, marble), timber floorings, Industrial floorings

5. **Stair case** [02]
   Requirement, location and classification, construction features of RCC, metal stairs

6. **Doors & Windows** [05]
   Classification, material, suitability, requirement & location, construction features of panelled & flushed doors/windows, fixtures & fastenings for doors/windows, metal doors/windows

7. **Roofs** [04]
   Classification, functions and requirement of roofs, roofing materials, construction of trussed roofs with AC/GI sheets, pre-cast and in-situe RCC roofs

8. **Building finishes** [03]
   Plastering, pointing, painting and white washing: construction materials & methods

9. **Building protection and maintenance** [03]
   Fire proofing, water proofing and anti-termite treatments, building maintenance

LEARNING OUTCOMES

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

- understand various building components and construction activities identify and select appropriate openings, roofs, flooring and types of finishes for buildings etc.
- select appropriate mode of vertical movements and design of staircase.
- apply special treatments like water resistance, thermal insulation acoustical construction.
- learn to draw various building elements & working drawing

RECOMMENDED TEXTBOOKS

1. Building Construction by Dr. B.C. Punamia, Laxmi Publication-Delhi.
2. Civil Engineering Drawing, Building Construction by Gurucharan Singh & S.C. Rangwala , Charotar Publication.

REFERENCE BOOKS

1. Building Construction byS.C Rangwala, Charotar Publication
2. Building Construction by Sushil Kumar, Standard Publishers
3. The Construction of Building by R. Barry, ELBS
4. Building Construction Handbook by Chudly&Greeno
5. Indian Standard Institution, National Building Code of India, ISI, 1984, New Delhi

LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

1. Drawings of all the above components e.g., Brick masonry bonds and junctions, Stairs, Doors & Windows.
2. Preparation of working drawing (Plan, elevation & section) of single-story building from given line sketch or given measurements.

(CL316) ENGINEEERING MATERIALS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	40	0	0	100	3	0	0	3

OBJECTIVES OF THE COURSE

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

DETAILED SYLLABUS

1. **Introduction** [04]
   Classification of Engineering Materials; Properties of Materials; Physical properties, Mechanical properties, Electrical properties, Magnetic properties, Chemical properties; Properties of Building materials; Structure of Atom, Bonding in solids, Metallic Bonding, Ionic Bonding, Vander walls force; Crystalline and Non-Crystalline nature of solids, Imperfections in crystal structure, Types of Imperfections- Vacancies, Dislocations, Plastic deformation of single crystal, Slip, Twinning etc.

2. **Stones** [02]
   Stone as building material; Criteria for selection; Tests on stones; Deterioration and Preservation of stone work

3. **Bricks** [02]
   Classification; Manufacturing of clay bricks; Tests on bricks; Compressive Strength; Water Absorption; Efflorescence

4. **Ceramic Materials** [02]
   Tiles; Roofing tiles; Flooring tiles; Glazed tiles, Special Industrial tiles, Earth ware, Stoneware, Porcelain

5. **Lime** [02]
   Sources of lime; Properties and constituents of lime; Uses of lime; Classification and Manufacturing of lime; Preparation of lime mortar

6. **Cement** [03]
   Cement; Ingredients; Manufacturing process; Types and Grades; Properties of cement and Cement mortar; Hydration; Compressive strength; Tensile strength; Fineness; Soundness and consistency; Setting time

7. **Timber and other materials** [06]
   Timber; Market forms; Industrial timber; Plywood; Veneer; False ceiling materials; Panels of laminates; Steel; Aluminum and Other Metallic Materials – Composition- Aluminum composite panel; Uses; Market forms; Mechanical treatment.

8. **Paints, Varnishes and Distempers** [04]
   Definition of Paints; Function of Paints; Preparation of an oil paint; characteristics of paint; Painting on Metallic surfaces and plastered surfaces.
   Definition of Varnishes; Function of Varnishes; Constituents of varnish; characteristics of varnish; Process of varnishing; Properties and types of distempers; distempering process

9. **Plastic** [02]
   Constituents of plastics; classification of plastics; properties of plastic; application of plastics

10. **Metals and Alloys** [04]
    Ferrous alloys like plain carbon and alloy steels, cast iron.; Non-ferrous alloys of copper, Nickel and Aluminum: Their compositions, properties and industrial application

11. **Advanced Materials used for Building Construction** [05]
    Fiber textiles – Geomembranes and Geotextiles for earth reinforcement, Fly ash; Gypsum and Gypsum Plaster; Concrete hollow blocks – Lightweight concrete blocks advance waterproofing materials, Fiber Reinforce Plastic

LEARNING OUTCOMES

On completion of this course the students will be able to

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

RECOMMENDED TEXTBOOKS

1. Rajput.R.K., Engineering Materials, S. Chand and Company Ltd., 2008.
2. Duggal.S.K., Building Materials, Third Edition, New Age International, 2008.
3. Rangwala S.K., Engineering Materials, Charotar Publications,2008.

REFERENCE BOOKS

1. Varghese.P.C, Construction Materials, Prentice Hall Inc., 2007.
2. Jagadish.K.S, Alternative Building Materials Technology, New Age International, 2007.
3. Relevant Indian Standard Codes of Practice.

(AF 411) MATHEMATICS IV

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	-	-	100	4	-	-	4

OBJECTIVES OF THE COURSE

- Ability to analyse and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics.
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as rules, and justify or prove them.

DETAILED SYLLABUS

1. **FUNCTIONS OF COMPLEX VARIABLE:**
   Analytic functions, Cauchy -Rieman equations, Harmonic functions, orthogonal system, complex potential function, Determination of conjugate function, conformal transformation, some standard transformations, bilinear transformation, line integral, properties of complex integration, Cauchy's theorem and Cauchy's integral formula.

2. **MATRICES:**
   Fundamental concepts, operations, associated matrices, matrix method of solution of simultaneous equations, Rank of Matrix, Linear dependence of vectors, consistency of a system of linear equations, characteristic equations, Eigen vectors and eigen roots, Cayey Hamilton theorem.

3. **FINITE DIFFERENCES & DIFFERENCE EQUATIONS:**
   Finite difference, Interpolation, Newton's forward and backward and central differences and Lagrange's formula, Strling & bessel's formula, Numerical differentation & Integration, Trapezoidal rule, Simpson's (both) rules, Difference equations with constant coefficient

4. **VECTOR CALCULUS:**
   Vector function of a single scalar variable, Differentiation of vectors, simple applications to plane, motion, scalar and vector point functions, Del applied to scalar point function (gradient) Divergence of a vector point function, curl of a vector, second order expressions, line integrals, surface integrals, Gauss theorem and stoke's theorem

5. **STATISTICAL METHODS:**
   Binomial distribution, poission distribution, normal distribution, calculation of errors, probable errors, standard error, coefficient of correlation, lines of regression.

LEARNING OUTCOMES:

At the end of the course students are able to,

- Able to apply the method of solving linear system of equations, linear transformation and Eigen value problem as they arise, for instance from electrical networks, framework in mechanics, curve fitting, other optimization problems and processes in statistics.
- Proficient to apply the theory and concepts of vector differential calculus and vector integral calculus in problems related to fluid flow, heat flow, electro static and so on.
- Understanding concept of Complex numbers and Complex functions and able to check the analyticity based on Cauchy-Riemann equations.
- Able to evaluate the complex integration and real integrals of practical interest.
- Able to interpolate and extrapolate the data with the help of numerical methods
- Able to handle data numerically or graphically, in order to see what properties data have and what kind of information we can extract and if data influenced by chance student may apply the concepts and rules of probability theory.

RECOMMENDED TEXTBOOKS:

1. Higher Engineering Mathematics, Dr. B.S.Grewal

REFERENCE BOOKS:

1. A Text Book of Applied Mathematics, P.N. & J.N. Wartikar & Chandrika Prasad

(AF410) FINANCIAL AND MANAGEMENT ACCOUNTING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	40	0	100	3	-	-	3

OBJECTIVES OF THE COURSE

- To enable students to understand, interpret & analyze Accounting System, Accounting books/ records Financial Statements & also understand & decide relevance of accounting information to Managerial Decisions.
- To familiarize students with the basic elements of the Financial Management.
- To enable students to evaluate performance of various business concerns by use of technique of ratio analysis, cash flow statement.

DETAILED SYLLABUS

1. **Financial Accounting – An Introduction**
   Introduction, Meaning of Accountancy, book-keeping and Accounting, Accounting Process, Objectives for accounting, Differences between book-keeping and accounting Users of accounting information, Limitations of Accounting, Basic terminologies.

2. **Accounting Concepts, Principles, Bases and Policies**
   Introduction , Accounting Concepts, Principles, Policies and Standards, Types of accounting concepts - Business Separate entity concept - Going concern concept - Money measurement concept - Periodicity concept - Accrual concept, Accounting Principles - Principle of Income recognition - Principle of expense - Principle of matching cost and revenue - Principle of Historical costs - Principle of full disclosure - Double aspect principle - Modifying Principle - Principle of materiality - Principle of consistency- Principle of conservatism or prudence, Accounting Policies - Changes in Accounting Policies - Disclosure in case of changes in Accounting Policies, Accounting Standards - Scope and functions of Accounting Standards Board - International Financial Reporting System

3. **Double Entry Accounting**
   Introduction, Meaning of double entry accounting, Classification of accounts under Traditional approach, Classification of accounts under Accounting Equation approach, Comparison of traditional approach with Modern approach equal approach, Accounting Trail, Transactions and events, Meaning and roles of debit and credit, Accounting equation.

4. **Secondary Books**
   Introduction, Secondary books, Purchases Book/Purchases Day book - Cash discount, Trade discount - Difference between cash discount and trade discount, Sales Book or Sales Day book - Purchase Returns Book - Sales Returns Book, bills receivable book - Bills payable book - Cash book, Posting to Ledger accounts Posting to Ledger

5. **Trial Balance**
   Introduction, Meaning, Objectives of preparing a trial balance, Methods of preparing a trial balance, Preparation of Trial balance, Adjusting Entries, Errors and their rectification, Errors disclosed by Trial Balance, Errors not disclosed by Trial Balance, Steps to locate the errors.

6. **Final Accounts**
   Introduction, Adjustments before preparing final accounts, Depreciation, Bad Debts and accounting treatment of bad debts, Provision for doubtful debts, Reserves for Discount on Debtors, Reserve for Discount on Creditors, Closing Stock, Trading Account, Profit and Loss Account, Balance Sheet.

7. **Introduction to Management Accounting**
   Introduction, Meaning of Management accounting, The Role of Management Accounting, Management Accounting Framework, Functions of Management Accounting, Tools of Management Accounting, The Balanced Scorecard, Cost Management System, Value Added Concept, Merits of Management Accounting, Demerits of Management Accounting, Distinction between Management Accounting and Financial Accounting.

8. **Financial Statement Analysis**
   Introduction, Meaning of Ratio, Steps in Ratio Analysis, Classification of Ratios, Du Pont Chart, Solved Problems, Advantages of Ratio Analysis, Limitation of Ratio analysis.

9. **Cash Flow Analysis**
   Introduction, Meaning of Cash Flow Statement, Purpose of Cash Flow Statement, Preparation of Cash Flow Statement, Format of Cash Flow Statement (AS3: Revised Method), Cash Flow from Operating Activities, Cash Flow Statement under Direct Method, Different between Cash Flow Analysis and Fund Flow Analysis, Uses of Cash Flow Statement.

10. **Marginal Costing and Break-Even Analysis**
    Introduction, Concept of Marginal Costing, Characteristics of Marginal Costing, Difference between Absorption Costing and Marginal Costing, Marginal Cost, Contribution, Cost Volume Profit (CVP) Analysis, Break Even Chart, Break Even Point, Profit Volume ratio or MCSR, Target profit, Margin of Safety, Application of Marginal cost, Limitations of Marginal cost, Solved Problems.

11. **Basics of Financial Management**
    Introduction of Financial Management, objectives of financial management, role of finance manager, functions of financial management, concept of time value of money, present value, future value, annuity concept, solved problems.

LEARNING OUTCOMES

- Students will gain understanding of various concepts of Accounting and Finance. They will learn how financial transaction are to be recognized and recorded in practical life. They will learn the concepts and principles governing final accounts and get practical exposure to make the analysis of the Final accounts of firms.

RECOMMENDED TEXTBOOKS

1. Financial Accounting for Managers – Text book & cases - Third Revised edition by S.K.hattacharya , John Dearden Published by Vikash Publishing House Private Limited
2. Management Accounting - By Ravi M. Kishore – Publisher: Taxman

REFERENCE BOOKS

1. Pandey I M, Financial Management, 10th edition, Vikas Publication, New Delhi.
2. Van horne, *"Fundamentals of Financial Management",* Pearson Education, 11th edition.
3. Brigham, *"Financial Management"*, Cengage Publication.
4. Kewown, J.Arthur, Martin, John, Petty, William, and Scott David, *"Financial Management: Principles and Applications"*,10th Ed. Pearson.
5. Chandra Prassanna, 10th Edition, TMH, New Delhi.
6. Cost Accounting by B K Bhar - Academic Publisher latest edition.
7. Cost Accounting by Charles, Srikant and George – PHI latest edition.

(CL410) RAILWAY AND TOWN PLANNING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	100	4	0	0	4

OBJECTIVES OF THE COURSE

- To introduce students with various components of railway engineering as well as town planning with recent advances

DETAILED SYLLABUS

[A] RAILWAY ENGINEERING

1. **Introduction**
   Types, Gauge, Alignment of Railways, Track Components

2. **Permanent Way** [04]
   Types of rails and Fastening, Welding of Rails, Conning of wheels, Roaring Rails, Creep. Sleepers- Timber, Steel, Cast iron and Concrete sleepers, sleeper spacing, ballast- functions and specifications, formation and drainage of permanent way.

3. **Geometric Design** [04]
   Grade and Curves, super elevation, cant deficiency, grade separation

4. **Resistance to traction** [04]
   Stresses in rails, sleeper, ballast and formation.

5. **Points and Crossings** [03]
   Layout of simple turnouts, A crossover, Gathering line.

6. **Station and Yards** [03]
   Layout of wayside stations, Junctions and terminals, Marshalling Yards and formation of trains

7. **Signaling and Interlocking** [04]
   Working of engineering block, Mechanical, Electrical and Automatic Signalling and Interlocking, Centralized traffic control.

[B] TOWN PLANNING

1. **Introduction** [02]
   Origin and Growth of town, Principles of Town Planning, stages of development, T.P. Schemes.

2. **Civil Surveys** [03]
   Purpose, type, data required, elements of city planning, circulation pattern, landscape pattern of building, use of master plan, central areas, town centre, civic spaces, shopping centre.

3. **Housing** [04]
   Neighborhood Units, Layout with houses.

4. **Building bye-laws** [04]
   Applicability of building bye laws, FSI, Set-Back, Light plane.

5. **Industry** [05]
   Priorities, Classifications, Siting Industrial estate.

6. **Redevelopment** [06]
   Slum clearance scheme, Town planning schemes, Satellite town, Control of ribbon development, street pattern, green belt, ring road and bye passes.

LEARNING OUTCOMES

On completion of this course students will be able to,

- Understand the and its components of railway engineering importance.
- Understands the design aspects of track and pavement of railways.
- Realize Role of railways in national development.
- Understand the problems of urban planning and can give possible solutions of it.
- Understand the terms related to civic bodies and its working pattern.

RECOMMENDED TEXTBOOKS

1. Town Planning- Charotar Publication – S.C. Rangwala
2. Railway Engineering- Saxena

REFERENCE BOOKS

1. Fundamentals of town planning- Dhanpat Rai & Sons. – G.K.Hiraskar
2. Planning and Designing of Buildings- Engg. Book Publishers- Sane Y.S.

(CL411) FLUID MECHANICS II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	2	0	60	40	25	0	125	4	2	0	6

OBJECTIVES OF THE COURSE

The objectives of the course are,

- To explain to the students the important concepts of laminar, turbulent and compressible flow and their applications in the civil engineering.
- To explain to the students the important concepts of open channel flow.
- To explain to the students the concepts of dimensional analysis and its practical use in design of hydraulic structures.
- To encourage the students to use programming techniques for the solution of problems in Civil Engineering.

DETAILED SYLLABUS

1. **OPEN CHANNEL FLOW** [18]

(a) Introduction; comparison between open channel flow and pipe flow; classification of open channel flows; Velocity distribution in open channel flow; Uniform flow: Chezy, Bazin, Manning , Ganguillet and Kutter's formula; most efficient hydraulic channel cross sections.
(b) Specific energy: concept of specific energy and specific force; specific energy and specific force curves; applications of these curves to channel transitions; metering flumes.
(c) Critical flow: critical flow in trapezoidal, rectangular and triangular channel.
(d) Gradually Varied Flow: Dynamic equation of gradually varied flow; classification of channel slopes; classification of surface profiles; Characteristics of surface profiles; back water and draw down profile computations.
(e) Hydraulic Jump: Hydraulic jump in rectangular channel; Sequent depths and their relation; Classification of jump; loss of energy in hydraulic jump; elements and characteristics of hydraulic jump; location of hydraulic jump; Applications of Hydraulic Jump. Hydraulic jump in non - rectangular channel.

2. **LAMINAR FLOW** [07]

Introduction; laminar flow in circular pipes: Hagen - Poiseullie Equation; laminar flow between parallel plates: (i) both plates at rest (ii) lower plate at rest and upper plate moving in its own direction - Couette's flow; (iii) Both plates moving in opposite direction. viscosity and it's

3. **TURBULENT FLOW IN PIPES** [07]

Characteristics of turbulent flow; hydro-dynamically smooth and rough boundaries; velocity distribution for turbulent flow in pipes; Karman - Prandtl equation; Nikuradse's experiments on artificially roughened pipes; Moody's diagrams; Stanton's diagrams, Aging of pipes; Friction factor in turbulent flow for smooth & rough pipes.

4. **BOUNDARY LAYER THEORY** [05]
   Boundary layer definition and characteristics; Momentum equation for boundary layer; Laminar and turbulent boundary layer; Total drag due to laminar and turbulent layers; Boundary layer separation and control.

5. **DIMENSIONAL ANALYSIS AND PRINCIPLES OF SIMILITUDE** [07]
   Concepts of dimensions and dimensional homogeneity; dimensionless parameters; Raleigh and Buckingham theorems; principles of similitude applied to the models of hydraulic structures; selection of scales; distorted models; scale effect.

6. **HYDRAULIC MACHINES** [04]
   (a) Turbines: Types of turbines; their characteristics and working; selection of turbines; cavitation.
   (b) Pumps: Types of pumps; their characteristics and working.
   (c) Hydraulic ram, hydraulic cranes and lifts.

COMPUTER APPLICATIONS TO SPECIFIED PROBLEMS

LEARNING OUTCOMES

On the completion of the course, one should be able to understand:

- The important concepts of open channel flow.
- The important concepts of laminar, turbulent and compressible flow and will be able to understand their applications in the civil engineering.
- The important concepts of dimensional analysis and its practical use in design of various
- hydraulic structures.

RECOMMENDED TEXTBOOKS

1. Fluid Mechanics by A K Jain, Khanna Publishers, New Delhi
2. Fluid Mechanics, by R K Bansal; Laxmi Publications

REFERENCE BOOKS

1. Flow in open channels by K. Subramanya, Tata-Mcgraw Hill Publication
2. Open Channel flow by Madan Mohan Das, PHI
3. Fluid Mechanics by R.K.Rajput, S. Chand & Co. publications
4. Fluid Mechanics & Hydraulic Machines by P.N.Modi and S.N.Seth, Standard Book House
5. Hydraulic Fluid Mechanics & Fluid Machines by S. Ramamurtham, Dhanpatrai Publishing Co.
6. Open Channel Hydraulics by V.T. Chow, McGraw Hill.
7. Flow through open channels by Rajesh Srivastava, Oxford University Press.
8. Fluid Mechanics by D.S. Kumar, S.K.Kataria& Sons
9. Theory and Applications of Fluid Mechanics by K. Subramanya, Tata-McGraw Hill Publishing Co., 1993, New Delhi
10. Engineering Fluid Mechanics by R.J. Garde, and A.C. Mirajgaoker, New Chand & Sons
11. Fluid Mechanics by F.M. White, McGraw Hill, New York

12. **Web Materials**
    1. **http://nptel.iitm.ac.in/video.php?subjectId=105101082**
    2. **http://nptel.iitm.ac.in/courses/IIT-MADRAS/Hydraulics/index.php**
    3. **http://nptel.iitm.ac.in/video.php?subjectId=105103096**

(CL412) STRUCTURAL ANALYSIS II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	2	0	60	40	25	0	125	4	2	0	6

OBJECTIVES OF THE COURSE

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

DETAILED SYLLABUS

1. **General** [04]
   Static and Kinematic Indeterminacy of Beam, Plane Frames, Plane Truss, Three Dimensional Structures. Stable and Unstable Structures. Principle of Superposition, Maxwell's Reciprocal Theorem.

2. **Energy Principles** [10]
   Castigliano's Theorem II, Analysis of Statically Indeterminate Beams, Trusses and Frames by Method of Consistent Deformation

3. **Slope Deflection Method** [06]
   Analysis of Continuous Beams including settlement/rotation of support

4. **Moment Distribution Method** [08]
   Analysis of Continuous Beams and Frames including sway. Use of Symmetry

5. **Analysis Of Fixed Beams** [04]
   for internal forces due to various loading type, support settlement and support rotation

6. **Analysis of Two Hinged and Three Hinged Arches** [06]
   for internal forces under the various loading condition

7. **Matrix Methods** [08]
   Introduction to Flexibility and Stiffness Method. System Approach to analysis of Beams and Plane Frame.

8. **Application Of Computer** for various problems in all the above method of Analysis [02]

   Termwork :
   Shall consist of at least 25 problems based on the Course under STRUCTURAL ANALYSIS-II

LEARNING OUTCOMES

The students have the advanced knowledge of methods of analysis like matrix methods, arch analysis and indeterminate simple structures analysis. After studying this subject student will be able to,

- Determine reactions & internal forces in statically indeterminate structures
- Determine forces and reactions in fixed beams and ar
- Determine the maximum reaction, shear force and bending moment for beams and trusses for rolling loads.

RECOMMENDED TEXTBOOKS

1. Basic Structural Analysis by C.S. Reddy, Tata McGraw Hill Publications
2. Intermediate Structural Analysis by Wang C. K.; Tata McGraw Hill book Company, New Delhi

REFERENCE BOOKS

1. Mechanics of Structures, Vol. I I by S. B. Junnarkar and H. J. Shah, Charotar Publication.
2. Mechanics for Engineers by F.P. Beer and Jhonston, McGraw Hill, New Delhi
3. Structural Analysis by Hibbler R C; Pearson Education
4. Structural Analysis by Devdas Menon, Narosa Publications
5. Indeterminate Structural Analysis by Kinney S., Oxford & IBH
6. Fundamentals of structural Mechanics and analysis by M.L. Gambhir, Prentice Hall India
7. Theory of Structures by Timoshenko S.P.& Young D.H, McGraw Hill

(CL413) SURVEYING II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES OF THE COURSE

- This subject deals with horizontal and vertical alignment for different sight conditions. Also, students are also exposed to the Modern Survey equipment.

DETAILED SYLLABUS

1. **PERMANENT ADJUSTMENTS** [04]
   Optics of the Telescope; Permanent Adjustment of Dumpy Level, Tilting Level and the Vernier Theodolite.

2. **TACHEOMETRY** [05]
   Principles of Tachometry; Use of analytic lenses; Field-work; Computation, Tachometric Table, Direct Reading Tachometers: Applications of Tachometry by digital Theodolite

3. **CURVES** [06]
   Theory of Simple, Compound, Reverse & Vertical Curves, Transition curves – Cubic, Spiral Cubic Parabola and Lemniscates

4. **ELECTRONIC DISTANCE MEASUREMENTS** [04]
   Principles & Instruments used, Trilateration, study of Total station

5. **PHOTOGRAMMETRY** [04]
   Principles, Photo-Theodolite, Aerial Photogrammetry, Stereoscopy and parallax and their applications, Field-Work, Plotting from air photographs, Applications of air Surveys.

6. **ERRORS** [04]
   Mistakes; Cumulative & Compensating Errors, Probability Curve; Principle of Least Squares; Probable Errors; R.M.S. Value; Weighted Observations. Adjustments of a Trilateration Network

7. **HYDROGRAPHY** [05]
   Gauge, Sounding, Location of Sounding

8. **FIELD ASTRONOMY & INTRODUCTION OF REMOTE SENSING, GIS AND GPS** [08]
   Field astronomy fundamentals, spherical Trigonometry, determination of terrestrial co-ordinate and Azimuth, Introduction to GIS and GPS.

LEARNING OUTCOMES

- Students are expected to use modern surveying equipment, prepare layout o contour map by using tacheometry survey, plotting of horizontal curves and able to understand concepts of advanced surveying methods of remote sensing.

RECOMMENDED TEXTBOOKS

1. Surveying Volume-1 & 2 by S K Duggal, Tata McGraw Hill Publication.

REFERENCE BOOKS

1. Fundamentals of Surveying by S K Roy, PHI Learning Pvt. Ltd Publication.
2. Surveying & Levelling by S C Rangwala, Charotar Publication House.
3. Surveying Volume 1,2 & 3 by Dr. K.R. Arora.
4. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni, Vidyarthi Book Depot, Pune.

LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Experiment No.	Name of Experiment
1.	Introduction To Transit Theodolite.
2.	Angle Measurement using Transit Theodolite by Repetition Method & Reiteration method.
3.	Height Measurement Of a Tall Building By Transit Theodolite.
4.	Instrument Constants For A Given Tacheometer.
5.	Tacheometry Survey Practice To Find RLs of Different Points for uneven ground.
6.	Practice on Tangential Tacheometry.
7.	To Find Gradient between Two Points By Tacheometry Survey.
8.	Plotting Of Circular Curve When L>>R by using linear methods.
9.	Plotting Of Circular Curve When L<<R by using linear methods.
10.	Project On Plotting Of Circular Curve By Rankine's Method.
11.	Introduction to Modern Survey Instruments (i) Digital Theodolite (ii) Total Station.
12.	Introduction to Computer application in Surveying like Profile levelling, Contouring, GPS, GIS etc.
13.	**List of Projects:** 1. Tacheometry survey project. 2. Plotting of circular curve by using Rankine's method by single instrument and by double instruments. 3. Plotting of Combined curve.

(CL513) GEOTECH AND APPLIED GEOLOGY

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
04	00	02	60	40	25	25	150	04	00	01	05

A OBJECTIVES OF THE COURSE

To understand the role of geology in design and construction of major civil projects .....

To Provide basic knowledge of types of soils and its classifications.

To carry out field and laboratory test to identify soils in Geotechnical engineering practice.

B DETAILED SYLLABUS **[Hr]**

1 INTRODUCTION: **[01]**

Definition, brief historical development, future prospects.

2 PHYSICAL GEOLGY AND ORIGIN AND NATURE OF SOIL: **[03]**

Surface Process and Landforms, Weathering and Erosin, Introduction to geological agents (river, wind, oceans, glaciers, groundwater) and their actions, Basic introduction of earth and crust of earth.

3 ORIGIN AND NATURE OF SOIL: **[02]**

Formation of soil by various agents, residual soils, alluvial soils, marine and lacustrine soils, Loess, Till, Peat.

4 SOIL STRUCTURE AND TEXTURE: **[07]**

Soil particle size and shape, specific surface, Clay minerals, atoms and atomic bonds, structure of clay minerals, different types of soil mass structures, soil particle size distribution, mechanical and hydrometer analysis.

5 PHYSICAL PROPERTIES OF SOILS: **[04]**

Void ratio, Porosity, degree of saturation, moisture content, unit weight, specific gravity, relative density of soil, Weight-Volume functional relationship.

6 SOIL WATER: **[02]**

Effect of moisture content on soil, ground water, hygroscopic moisture, capillary water, apparent cohesion.

7 SOIL-WATER CONSISTENCY: **[03]**

Liquid limit, Plastic limit, Plasticity Index, Liquidity Index, Shrinkage limit, Plasticity chart.

8 IDENTIFICATION AND CLASSIFICATION OF SOIL: **[03]**

Field identification of soil Engineering classification of soil, Textural classification of soil, group index, Unified classification of soil, I.S. Classification of soil, Practical use of soil classification.

9 SUBSURFACE INVESTIGATION: **[03]**

Planning soil exploration, Methods of exploration, Soil borings, sounding,

sampling, spacing and depth of borings, Stand and penetration test, record of field investigation.

10 MINERALS: **[02]**

Definition, important physical properties of Minerals, basic idea of Crystal System, study and identification of common rock forming Minerals, Clay Minerals and their properties.

11 ROCKS: **[03]**

Definition and Main rock types

A. Igneous rocks: Definition, Acidic and Basic Rocks, Textures and Classification of Igneous Rocks, Dykes and Sills, Study and Identification of Common Igneous Rocks with their uses.

B. Sedimentary Rocks: Definition, Mode of Formation, Particle Size in Sediments, Consolidation,
Structures of Sedimentary Rocks, Classification, Study and Identification of common Sedimentary Rocks with their uses.

C. Metamorphic rocks; Definition; Agents, Types and Grades of Metamorphism. Classification and Structures of Metamorphic Rocks. Study and Identification of common Metamorphic rocks with their uses.

12 GEOLOGICAL STRUCTURES: **[02]**

Stratification, Outcrops, Dip and Strike, Use of Clinometer Compass, Types of Folds & Faults, Unconformity and Joints, Effects of Geological Structures on Engineering Structures.

13 SUBSURFACE WATER: **[03]**

Source, varieties and distribution of subsurface water, Water Table, Ground water mounds and depression effects of Cone of depression. Fluctuation of water table relationship, Fresh and Saline ground water. Artesian water and Springs, Methods of ground water investigation.

14 ROCK MECHANICS: **[05]**

Geotechnical Investigation in Rocks, Methods of rock exploration, Core drilling and core recovery, R.Q.D., Geological and Engineering classification of rocks, Important physical and mechanical properties of rocks and their methods of testing in laboratory. Outlines of Seismic and Resistively methods.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 An ability to carry out specific field investigation including collection of soil and rock samples for testing and observation of soil and rock behaviour also able to identify and classify soil based on standard geotechnical engineering practice.

D RECOMMENDED TEXTBOOKS

1 Soil Mechanics and Foundation engineering by B.C.Punmia, Laxmi Publishers

2 Engineering and General Geology by Parbin Singh, Katson Publication

E REFERENCE BOOKS

1 Soil Mechanics and Foundation engineering by V.N.S Murthi, UBS Publish

2 Principles of Geotechnical Engineering by B.M. Das, Tata McGraw Hill Publication
3 SP-36-1: Compendium of Indian standards on soil Engineering: Part-1 Laboratory testing of Soils for civil Engineering Purpose.
4 SP-36-2: Compendium of Indian standards on soil Engineering: Part-2 Field testing of Soils for civil
5 Engineering Purpose.
6 IS : 13365 Classification system of rock mass.
7 IS: 9143 Method of determination of Unconfined compressive strength.
8 IS:12070 Code of Practice for Design and construction of shallow foundation on Rocks.

F LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

Experiment No.	Name of Experiment
1	Field density test by core cuter method.
2.	Field density test by sand replacement method.
3.	To determine specific gravity of soil sample.
4.	To determine percentage of various size of soil particles by fine sieve analysis.
5.	To determine percentage of various size of soil particles by hydrometer analysis.
6.	To determine liquid limit and plastic limit of given soil sample.
7.	To determine shrinkage limit of given soil sample.
8.	To determine % free swell of soil.
9.	To determine Relative density of soil.
10.	Rock Identification.
11.	To determine Physical properties of Rock.
12.	To determine Compressive strength of rock and one point method.
13.	To determine slake durability of rock.

The term work shall consist of about 25 problems from the course work.

(CL514) STRUCTURAL ANALYSIS III

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
04	02	00	60	40	25	00	125	04	02	00	06

A OBJECTIVES OF THE COURSE

To equip the students with the classical methods of structural analysis with emphasis on analysis of indeterminate structures.

B DETAILED SYLLABUS [Hr]

1 PLASTIC METHOD: [06]
Elementary Plastic Theory of Bending, Plastic Hinges, Plastic Moment of Resistance, Shape Factor, Load Factor, Collapse Load, Collapse Mechanism, Analysis of Beams And Portal Frame

2 INFLUENCE LINES FOR INDETERMINATE STRUCTURES [08]
Muller Breslau Principle Applied to Beams & Frames.

3 APPROXIMATE METHODS: PORTAL METHOD, [04]
Cantilever Method and substitute method

4 BEAMS CURVED IN PLAN AND ELEVATION [03]

5 SPHERICAL AND CONICAL DOMES [03]

6 COLUMN ANALOGY METHOD: [06]
Application To Fixed Beams - Analysis Of Beam Of Prismatic And Non-Prismatic Types. Evaluation Of Stiffness And Carry-Over Factors.

7 PRESTRESSED CONCRETE: [08]
Properties Of High Grade Concrete And High Steel, Pre-Tensioning And Post-Tensioning, Losses In Prestress, Analysis Of Sections In Flexure.

8 STIFFNESS MEMBER APPROACH [10]
Stiffness Member Approach For Beams And Plane Truss

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 The students have the advanced knowledge of methods of analysis like Plastic methods, Approximate Method and Prestressed Concrete.
2 Determine the maximum reaction, shear force and bending moment for Indeterminate beams and trusses for rolling loads.
3 Determine reactions & internal forces in statically indeterminate structures.
4 Determine forces and reactions in spherical and conical domes.

D RECOMMENDED TEXTBOOKS

1 Basic Structural Analysis by C. S. Reddy, Publisher- Tata McGraw Hill.

E REFERENCE BOOKS

1. Indeterminate Structural Analysis By Kinney Publisher- Oxford
2. Indeterminate Structural Analysis By C. K. Wang Publisher- Tata McGraw Hill
3. Analysis Prestressed Concrete By Krishna Raju Publisher- Tata McGraw Hill
4. Fundamentals of structural Mechanics and analysis by M.L. Gambhir,

F LIST OF TUTORIALS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

Tutorials no.	Name of Tutorials
1	Plastic Method
2.	Influence Lines for Indeterminate Structures
3.	Stiffness Member Approach
4.	Prestressed Concrete
5.	Column Analogy Method
6.	Beams Curved In Plan And Elevation
7.	Approximate Methods

(CL515) PLANNING & ARCHITECTURE

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	**Tut**	**Prac**	**Ext**	**Sess.**	**TW**	**Prac**	**Total**	**Lect**	**Tut**	**Prac**	**Total**
03	00	02	60	40	25	25	150	03	00	01	04

A OBJECTIVES OF THE COURSE

- To understand, plan, develop and design different types of buildings and the systems affiliated to it.
- It also takes care of safety, economy, convenience, adoptability, sustainability and energy saving. Concepts in building design

B DETAILED SYLLABUS [Hr]

1 **General Principle of Architecture** [04]
Study of general principles of architectural proportions and compositions. – Mass composition, principle of elevation development technique and colours.

2 **Building regulations & building bye-laws**, layout plan, built-up area, FSI, frontage/setbacks, parking etc., vertical transportation, projections, fire & safety. [03]

3 **Principles of Planning**. – Basic areas in residential buildings, process of planning, family requirements, conceptual plan outline, principle and techniques of functional planning. [06]

4 **Planning of residential buildings** - Plan preparation for residential units, structure, space and analysis, activity space, elements of human scale, size and dimension, furniture layout. [04]

5 **Planning of Non-Residential Buildings**- Approach of activity for public buildings, hostel, school, office, primary health centre- space norms, basic areas, functional setting areas. [04]

6 **Building Drawings**- Key plan, site plan, working drawing, perspective drawing, introduction to building drawing sSoftware. [09]

7 Use of National Building Code guide lines for building services, electrification, plumbing, firefighting system etc., Basic Principles. [06]

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Students can plan the buildings according to architectural principles incorporating building bye laws.
2 Students can draw various design alternative plans for various types of buildings.

D RECOMMENDED TEXTBOOKS

1 Planning & Designing of Buildings, by Y.S. Sane. Engineering Book Publishers, Pune

E REFERENCE BOOKS

1 Building Planning and Drawing, by, Kumara Swamy and Kameshwar Rao. Charotar Publications.
2 Building Drawings, by, Shah-Kale-Patki, Tata McGraw Hill
3 Civil Engineering Drawing, by, Gurucharan Singh, Chand Publications.
4 National Building Code (2016)/ SP-7

F LIST OF DRAWING TO BE PREPARED UNDER THIS SUBJECT HEAD

Experiment No.	Name of Experiment
1	Planning of Residential Building
2.	Planning of Flat in Multi-storey Building
3.	Planning of Public Building
4.	Planning of Institutional Building
5.	Planning of Industrial Building

(CL516) DESIGN OF STRUCTURES I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
04	02	00	60	40	25	00	125	04	02	00	06

A OBJECTIVES OF THE COURSE

To make students familiar with the fundamental design philosophies of reinforced concrete and steel structures and learn element design.

B DETAILED SYLLABUS [Hr]

(I) DESIGN OF REINFORCED CONCRETE STRUCTURES

1 INTRODUCTION: [03]
Introduction to various design methods i.e. Working Stress Method, Ultimate Load Method and Limit State Method - Brief History and Comparison.

2 DESIGN OF BEAMS BY WORKING STRESS METHOD: [03]
Design of Singly Reinforced Rectangular Beams by Working Stress Method for Flexure only.

3 ELEMENT DESIGN BY LIMIT STATE METHOD: [18]
Design of Singly Reinforced and Double Reinforced Rectangular Beams for Limit State of Collapse for Flexure, Design of Flanged Beams for Limit State of Collapse for Flexure, Design of Rectangular Beams for Limit State of Collapse for Shear, Design One-way and Two-way slabs (all simply supported), Design of Axially loaded Short Columns and Isolated Footings, Staircase.

(II) DESIGN OF STEEL STRUCTURES

1 INTRODUCTION: [05]
Introduction to various design methods i.e. Working Stress Method, Ultimate Load Method and Limit State Method - Brief History and Comparison. WSM applied to Tension and Compression Members.

2 DESIGN OF TENSION MEMBERS: [05]
Members made up of single and built-up sections, Choice of sections, Connections (riveted, bolted & welded), Splices.

3 DESIGN OF COMPRESSION MEMBERS: [06]
Single and Built-up sections, Choice of sections, lacing and battering.

4 BEAMS: [04]
Laterally Restrained and Unrestrained including deflection check.

5 FOUNDATIONS: [04]
Design of Slab base, Gusseted base.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Students will be able to handle element design of RCC Structures and Steel Structures as per Limit State Method of Design.

D RECOMMENDED TEXTBOOKS

1 Reinforced Concrete Design by S Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill Publication
2 Design of Steel Structures by N. Subramanian, Oxford Publication

E REFERENCE BOOKS

1 Design of RCC Structures Vol-I by H. J. Shah, Charotar Publication
2 Reinforced Concrete Design by N. Krishna Raju, R. N. Pranesh, New Age International Publishers.
3 Design of RCC Structures by P. C. Varghese, PHI Publications
4 Limit State Design of Steel Structures, S. K. Duggal, Mc Graw Hill Publications.
5 Design of Steel Structures, Arya & Ajmani, Nemchand & Sons Publications.
6 IS 456:2000 (Reaffirmed 2005), Plain and Reinforced Concrete - Code of Practice (Fourth Revision)
7 IS 800:2007, General Construction in Steel – Code of Practice (Third Revision)
8 IS 875 (Part 1): 1987, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and
9 Structures (Dead Loads)
10 IS 875 (Part 2): 1987, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and
11 Structures (Imposed Loads)
12 IS 875 (Part 1): 2015, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and

F LIST OF TUTORIALS TO BE PERFORMED UNDER THIS SUBJECT HEAD.

Tutorials no.	Name of Tutorials
1	Orientation Exercise
2.	Design of RCC Beam by WSM
3.	Design of RCC Beam by LSM for Flexure and Shear
4.	Design of T-Beam
5.	Design of Simply Supported Slabs
6.	Design of Axially Loaded RCC Column & Footing
7.	Design of Connections
8.	Design of Tension Members
9.	Design of Compression Members
10.	Design of Steel Beams

(CL517) CONCRETE TECHNOLOGY

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	00	02	60	40	25	25	150	03	00	01	04

A OBJECTIVES OF THE COURSE

- To make the students aware of the various techniques and practices on basic construction materials like Cement, Concrete, aggregates etc. and careful selection of suitable construction materials and their mix proportions to satisfy performance criteria of structure.
- To get on hand practical experience of various Quality control techniques for Concrete.

B DETAILED SYLLABUS [Hr]

1 CEMENT **[06]**

History of cementing materials, Manufacture of Portland cement, Chemical composition and hydration mechanism of OPC, Properties of cement hydrates, Composition, properties and use of various cements, Physical properties and testing of cement

2 AGGREGATES **[04]**

Classification of aggregates based on size, source and shape, texture; Physical properties of aggregates, specific gravity, bulk density, porosity and absorption, Moisture content, Strength and soundness of aggregate, Alkali-aggregate reaction,Grading requirements and practical grading, gap graded aggregates

3 ADMIXTURES **[03]**

Water reducing admixtures, plasticizers, super plasticizers, Accelerators, Retarders, Air entraining agents, water proofing agents, Effect of various admixtures on concrete properties, Mineral admixtures

4 FRESH CONCRETE **[03]**

Workability – factors affecting workability, Measurement of workability, Segregation and bleeding of concrete, Batching, Mixing, Conveying, Placing, compacting and curing of concrete.

5 STRENGTH OF CONCRETE **[03]**

Factors affecting strength, water-cement ratio, Gel/space ratio, Maturity concept of concrete, Tensile and Compressive strength of concrete,
Failure mechanism under compression and tension.

6 ELASTICITY, CREEP AND SHRINKAGE **[03]**

Elastic properties of concrete, factors affecting modulus of elasticity,
Dynamic and static modulus, creep of concrete, factors affecting creep Shrinkage-classification, reasons and mechanism of various shrinkage in concrete, Moisture movement in concrete.

7 DURABILITY **[04]**

Permeability of concrete, sulphate attack & its control, Sea water attack, corrosion, thermal properties of concrete, Fire resistance, resistance of concrete to freezing and thawing conditions, Resistant to abrasion, erosion and cavitations, crack in concrete & its control

8 TESTING OF CONCRETE **[03]**

Compression test – cube and cylinder, tensile strength testing
Non-destructive testing – Rebound hammer,
Ultrasonic pulse test, Pull out test, variation in test results

9 MIX DESIGN **[03]**

Statistical quality control of concrete, concept of mix design, Specification of mix design, IS method for concrete mix design, Acceptability criteria, Variability of result. Statistical quality control of concrete, concept of mix design

10 SPECIAL CONCRETE **[04]**

Classification, raw material and application of special concretes, Self-compacting concrete, High strength and High Performance Concrete, High volume fly ash concrete, Light weight concrete, polymer concrete, fibre-reinforced concrete, High density concrete, Aerated concrete,etc. Special concreting methods: Pumpable concrete, Ready mix concrete.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1. Understand basic constituents of the concrete and their applications.
2. Overall understanding on manufacturing process of concrete, behaviour of Concrete, characteristics of concrete.
3. In addition to traditional methods, students will get to know about Modern Concretes, Various admixtures and Quality control techniques through on hand practical experience.
4. Do most optimum methods for Concrete mix designs.

D RECOMMENDED TEXTBOOKS

1. M.S.Shetty “Concrete Technology” S.Chand Publishers, New Delhi,2005
2. A.N.Neville & J.J.brooks “ Concrete technology” ELBS publication,1987

E REFERENCE BOOKS

1 Mehta, P.K, Monterio P.J.M.”,Concrete -Microstructure, Properties and Materials” Third edition, McGraw hill Publishers, New Delhi,1993
2 M.L.Gambhir “Concrete Technology” McGraw hill Publishers,N.Delhi,2005
3 A.N.Neville “ Concrete technology” ELBS publication,1987
4 I.S. Concrete Mix Proportioning- Guidelines. (IS10262:2009)
5 IS:456-2000, “Plain and Reinforced concrete code of practice, BIS, New Delhi
6 IS:383-1970. “Specification for coarse and fine aggregates from natural source of concrete, BIS, New Delhi.

F LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

Experiment No.	Name of Experiment
1	Fineness of cement (By sieving).
2.	Standard Consistency of cement paste.
3.	Initial and Final setting time of cement
4.	Compressive strength of cement mortar.
5.	Sieve analysis of coarse and fine aggregates.
6.	Slump test.
7.	Compacting factor test
8.	Flow test
9.	Compressive strength of cubes and cylinders
10.	Modulus of Rupture test
11.	Rebound hammer test
12.	Ultrasonic Pulse Velocity Test

(AF501) PROFESSIONAL COMMUNICATION I

Teaching Scheme			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
1	0	2	50	-	-	50	100	1	-	1	2

A. OBJECTIVES:

- To develop confidence in the students for communicating at workplace.
- Develop their Listening, Speaking, Reading, and Writing Skills.
- To give exposure of communicating with public.
- How to develop fluency in English Language.
- To prepare students for placement.
- To teach how to be effective at the job.

B. DETAILED SYLLABUS

1. **INTRODUCTION TO PROFESSIONAL COMMUNICATION:**
   importance, Methods and Manners, Need of Professional Communication, Objectives of Professional Communication, Skills required for Professional Communication, Employers' Expectations
2. **COMMUNICATION AND BARRIERS:**
   Introduction, Process, Principles, Components, Types of Communication, Main problems of Communication, Verbal Communication, Oral Communication, Written Communication Advantages of Verbal Communication, Limitations of Verbal Communication
   Non-verbal communication, Importance of Non, Verbal, Kinesics, Proxemics, Chronemics, Haptics. Oculesics, Paralanguage, Barriers of Communication, Intrapersonal, Inter-Personal, Organizational, Noises in Channel, Physical, Semantic, Psychological, Physiological,
3. **LANGUAGE PROFICIENCY:**
   Introduction, Basic Grammar Rule, Vocabulary Building, Language Games
4. **FOUR SKILLS:**
   Introduction, Listening, Process, Types of Listening, Six Stages of Listening, Listening Criticism, Characteristics of effective listening, Speaking, Elements of speaking skills, Pronunciation, Speech art, Reading, Skimming, Scanning, Intensive Reading, Levels of Comprehension (Literal and Inferential), Techniques of Good Comprehension, Improving Comprehension Skills, Writing, Developing Writing skills, Letter and E-mail writing

A. LEARNING OUTCOMES:

After completion of this course students will be able to understand:

1. Communication Process and framework
2. Obstacles in Communication
3. Possible remedies to barriers of communication
4. Effective Listening, Reading, Writing and speaking skills
5. Implementation of Non-Verbal features in the presentation

6. Ways and manners Presentations, Speech, Group talk and Interview
7. Competence in writing and reading

B. RECOMMENDED TEXTBOOKS

1. Meenakshi Raman, Sangeeta Sharma. *Technical Communication*: *Principles and Practice*; Oxford University press: New Delhi, 2004.
2. Meenakshi Raman, Prakash Singh. *Business Communication: Second edition;* Oxford University Press: New Delhi, 2012.
3. Steve Hart, Arvind R. Nair, Veena Bhambhani. *Embark: English for Undergraduates;* Cambridge University Press: Delhi, 2016.
4. T M Farhathullah. *Communication Skills for Technical Students;* Orient Longman P.ltd

(CL613) SOIL MECHANICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
04	00	02	60	40	25	25	150	04	00	01	05

A OBJECTIVES OF THE COURSE

- To establish an understanding of the fundamental concepts of mechanics of different types of soil materials including behaviour of materials.
- To build the necessary theoretical background for design and construction of foundation systems.

B DETAILED SYLLABUS

1 INTRODUCTION **[01]**

Introduction, Types of problems – Plastic, elastic and elasto-plastic analysis, Problems for soil as contraction and foundation material.

2 PERMEABILITY AND SEEPAGE: **[06]**

Introduction to permeability, Darcy's Law and its validity, Discharge and Seepage velocities, Laboratory determination of permeability, Field methods of determination of k, Approximate values of the co-efficients of permeability, permeability of stratified soil masses, factors affecting permeability

Introduction to Seepage, Laplace equation, Flow net construction, Determination of quantity of seepage and seepage pressure and uplift pressures, Quick sand condition.

3 COMPACTION: **[06]**

Definition, theory of compaction, Laboratory compaction tests, Factors affecting compaction in the field, Effect of compaction on soil properties, Field compaction, Specifications of field compaction, Special compaction techniques.

4 STRESS DISTRIBUTION STRESSES IN SOIL: **[10]**

Introduction, Boussinesq's equation for concentrated load, Westergaard's equation for concentrated loads, Comparison of Boussinesq and Westergaard's equations, Line loads, Strip loads, Stresses beneath the corner of a rectangular foundation, Stresses under uniformly loaded circular footing, vertical stress beneath loaded areas of irregular shape, Pressure isobars, Newmark's Influence chart

5 CONSOLIDATION OF SOILS: **[07]**

Compressibility of Soils, Definition and Mechanism of Soil, Consolidation, Spring Analogy, Compression Index, Coefficient of Compressibility, Coefficient of volume change, Derivation of Terazagi's One Dimensional consolidation Equation, Time factor and consolidation ratio, calculation of consolidation settlement for uniform pressure increment in clay layer, one Dimensional consolidation test, Laboratory and theoretical time curves.

6 SHEARING RESISTANCE AND STRENGTH: **[07]**

Mohr's strength theory, Mohr-Coulomb strength theory, Types of shear tests: Direct shear test, Unconfined compression test, triaxial compression test, Drainage conditions – UU, CU, CD, Vane shear Test, Effective Stress principle.

7 EARTH PRESSURE: **[06]**

Active and passive earth pressure due to backfill, Earth Pressure at rest, Rankine's earth pressure theory, Coulomb theory of earth pressure, Culmann's graphical method to find Active earth pressure, Poncelete's construction for active earth pressure.

8 STABILITY OF SLOPES: **[05]**

Idealized Condition used in the analysis, factor of safety, Infinite and finite slopes, Stability of Infinite slopes, Introduction to Swedish Circle Method of Analysis, Fellenius method to locate centre of most critical failure rupture, Taylor's Stability Number.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 An ability to apply knowledge of mathematics, science and engineering, an ability to design and conduct experiments also analyze and interpret data, an ability to identify, formulate and solve engineering problems

D RECOMMENDED TEXTBOOKS

1 Soil Mechanics and Foundation engineering by V.N.S Murthi, UBS Publisher

E REFERENCE BOOKS

1 Principles of Geotechnical Engineering by B.M. Das, Tata McGraw Hill Publication

2 SP-36-1: Compendium of Indian standards on soil Engineering: Part-1 Laboratory testing of Soils for civil Engineering Purpose.

3 SP-36-2: Compendium of Indian standards on soil Engineering: Part-2 field testing of Soils for civil Engineering Purpose.

4 Soil Mechanics and Foundation engineering by B.C.Punamia, Laxmi Publishers

5 Basic Soil Mechanics by Whitlow, Construction Press

6 Advanced Soil Mechanics by B.M. Das, Tata McGraw Hill Publication

F LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

Experiment No.	Name of Experiment
1	To determine Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) for a given soil sample by Light Compaction test.
2.	To determine Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) for a given soil sample by Heavy Compaction test.
3.	To determine Coefficient of the Permeability of the given soil sample using Constant Head Permeability test.
4.	To determine Coefficient of the Permeability of the given soil sample using Falling Head Permeability test.

5. To determine Shear Strength parameters (c & Φ) of given soil sample using Direct Shear test.

6. To determine shear strength parameters (c & Φ) of given soil sample using Unconfined Compression test.

7. To determine undrained shear strength of given clay soil sample using Laboratory Vane Shear test.

8. To determine shear strength parameters (c & Φ) of given soil sample using Triaxial Unconsolidated Undrained test

9. To determine consolidation parameters of given soil sample using odometer test.

(CL614) ENVIRONMENTAL ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
04	00	02	60	40	25	25	150	04	00	01	05

A OBJECTIVES OF THE COURSE

- To understand basic concepts and unit process of water and sewage treatments
- To understand sources of water, water requirement for various uses and estimate the quantity of drinking water and domestic waste water for a given locality.
- To know the characteristics which defines quality of drinking water and sewage.
- To learn the design of conventional water and sewage treatment plants.
- To understand sewerage system and its design.

B DETAILED SYLLABUS [Hr]

1 INTRODUCTION [02]

Sources of Environmental contaminants, Water supply, Sewerage, Sources & types of water pollutants, Interrelationship of environmental System Overview: Water Resource Management System, Waste water management system.

2 QUANTITY OF WATER & SEWAGE [03]

Relation of quantity & population, water use for different purposes, design periods, Per capita demand, Various types of Water demand: Domestic, Institutional, Fire, Public use demand, Factors affecting water demand, Methods of Population forecasting, suitable application of each method, Numerical examples on methods of forecasting population and water requirement., Variation in water demand- Seasonal, Monthly, Hourly and daily variation.

3 QUALITY OF WATER [04]

Water & its impurities, Water quality criteria for drinking purpose, Water analysis, IS standards for potable water, Determination of physical, characteristics of Water: Temperature, Turbidity, Colour, Taste and odor , Determination of chemical characteristics of Water : pH, Solids, Chloride, Hardness., Flouride, Iron and Manganese, Nitrogen etc., Determination of bacteriological characteristics of Water : MPN, Membrane Filter technique.

4 COLLECTION OF WATER [02]

Intakes, Types of Intakes : Canal intake, River intake, Lake intake, Reservoir intake.

5 WATER TREATMENT **[05]**

Conventional water treatment & its objectives , Sedimentation, Coagulation-flocculation, Filtration, Mechanism of filtration, Disinfection,Miscellaneous water treatment techniques.

6 DISTRIBUTION OF WATER **[03]**

Distribution system, Elevated service reservoir, Valves, Design of water distribution system

7 SEWEWRAE **[02]**

General considerations, terminology, separate versus combined system of sewer

8 SEWEWRAE SYSTEM **[03]**

Sewer materials, Sewer appurtenances, Design of sewer systems, Construction and maintenance of sewer

9 CHARACTERISTICS OF WASTEWATER **[05]**

Variability of wastewater & water analysis, Physical characteristics, Chemical characteristics, Biological Characteristics, Decomposition of sewage,Bio-chemical oxygen demand, chemical oxygen demand, B.O.D. Test, Numericals based on B.O.D., Microbiology of sewage, Decomposition of sewage, sampling.

10 WASTE-WATER TREATMENT **[09]**

Objectives, Preliminary treatment , Physical unit processes : Screening,grit removal, Oil and grease removal, Sedimentation, Physico treatment process Coagulation -Flocculation ,Flow Diagram of Sewage treatment plant, Biological Unit Processes : Theory, Principles, Design of Activated sludge process, ASP & its modifications, operational difficulties in ASP, SVI, SDI, Attached growth processes- trickling filters, Std. rate and High rate trickling filter, Operational difficulties, Design using NRC equations, Waste stabilization ponds, Onsite Sewage treatment process- Septic tank and its design., Basics of Anaerobic digestion, Process biochemistry of sludge digestion.

11 SLUDGE TREATMENT & ITS DISPOSAL **[02]**

Importance of sludge management, Quantity & quality of sludge,
Major sludge treatment processes, Management & disposal of sludge.

12 SEWAGE DISPOSAL **[02]**

Disposal techniques, Water quality management in rivers , Water quality-modelling- DO Sag curve.

13 AIR POLLUTION **[06]**

Air Resource Management System, Sources of Air pollutants, Classification of pollutants, Ambient air quality standards , Origin and fate of air pollutants, Meteorology- Atmospheric dispersion, Effect of air pollutants on health, vegetation and material, Air pollution control of stationary sources.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Estimate the quantity of drinking water and domestic waste water for a given locality.
2 Know the characteristics which defines quality of drinking water and sewage.
3 Understand various unit processes and operations used for water and domestic wastewater treatment
4 Design conventional water and sewage treatment plants.

D RECOMMENDED TEXTBOOKS

1 G.S.Birdie & J.S. Birdie "Water supply and Sanitary Engineering",Dhanpatrai Publishing Company Ltd., 2007.

2 Metcalf & Eddy "Waste water Engineering-Treatment, Disposal and Reuse",Tata Mcgraw Hill publication,2005

3 M.L.Davis and D.A. Cornwell "Introduction to Environmental Engineering", Tata Mcgraw Hill publication,2005

E REFERENCE BOOKS

1 Steel & MgZee "Water & Waste water Engineering" Tata Mcgraw Hill publication,2003

2 Peavy, Rowe, Tchobanoglous "Environmental Engineering", McGraw Hill International edition,1985

3 K N Duggal "Elements of Environmental Engineering", S.Chand & Company Ltd,2010

4 "Manual on Water supply and treatment"3rd Ed.Pub: CPH & Env. Engg. Organization, Ministry of Urban Development, Govt. Of India, New Delhi, 1991.

5 "Manual on Sewage and Sewerage treatment"3rd Ed.Pub: CPH & Env. Engg. Organization, Ministry of Urban Development, Govt. Of India, New Delhi, 1991.

F LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD

Experiment No.	Name of Experiment
1	pH Value of water sample
2.	Turbidity of water sample
3.	Total solids of water sample
4.	Total suspended solids of water sample
5.	Total hardness of water sample
6.	Jar test
7.	Biological oxygen demand (BOD) of waste water sample
8.	Chemical oxygen demand (COD) of waste water sample.
9.	Determination of Suspended Particulate matter(SPM) in air

The term work shall consist of about 25 problems from the course work.

(CL615) WATER RESOURCE ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	00	00	60	40	-	-	100	03	00	00	03

A OBJECTIVES OF THE COURSE

Water resources of world and India, Scope and application of hydrology.
Hydrologic cycle, Various types of rain gauges to measure precipitation, Analysis of rainfall data, Various types of water losses and to estimate evaporation and infiltration loss from a basin, Run-off process.
Uses of hydrograph in water resources, Concept of stream gauging, Importance floods in water resources and flood frequency studies, Techniques of artificial recharge, the concept of groundwater development and management.

B DETAILED SYLLABUS **[Hr]**

1 INTRODUCTION **[02]**

Hydrologic cycle; History of hydrology, Scope and application of hydrology; Hydrologic equation.

2 PRECIPITATION **[07]**

Forms of precipitation; Types of precipitation; Measurement of precipitation; Adjustment of precipitation data; Double mass curve analysis; Mean areal depth of precipitation; Optimum Rain-Gauge Network Design; Depth - Area - Duration analysis; Geographical distribution, Time distribution and variability ofprecipitation; Graphical Representation of precipitation; Analysis of rainfall data

3 WATER LOSSES **[06]**

(a) Various types of water losses
(b) Evaporation; Factors affecting evaporation; Measurement of evaporation; Evaporation in reservoirs; Methods of computation; Methods of reducing evaporation;
(c) Infiltration; Factors affecting Infiltration; Methods of Determining Infiltration; Infiltration Indices

4 RUN-OFF **[04]**

Runoff process; Relation of storm period; Rainfall to runoff; Factors affecting runoff;
Methods of computation; Gauging of stream; Stage – Discharge Relationships; Interpretation of stream flow records.

5 HYDROGRAPH ANALYSIS **[06]**

Definition; Components of stream flow, hydrograph; Separation of hydrograph components; Factors affecting shape of hydrograph; Unit hydrograph; Propositions of unit hydrograph; Derivation of Unit Hydrograph from flood Hydrograph; Altering Duration of Unit Hydrograph; Unit Hydrograph from complex storms; S - hydrograph; Instantaneous unit hydrograph; Synthetic unit hydrograph.

6 SUBSURFACE HYDROLOGY **[05]**

Techniques of artificial recharge; Solutions to Transient problems of ground water mounds; Theory of subsurface drainage; Stream aquifer system; Ground water quality; Sea water intrusion into coastal aquifers; approximate solutions; Multiple well systems; Hydrogeologic systems analysis; Digital and analogue models for evaluations of aquifer response; Groundwater development and management.

7 FLOODS **[06]**

Causes of floods; Factors affecting flood flow; Methods of estimation of peak flood;
Flood
frequency studies; Envelope curves; Rational method; Gumbel's method;
Flood control.

Relevant computer programs / tools to be used in respective chapters.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Calculate mean precipitation depth over a catchment
2 Understand various methods of analysis of rainfall data
3 Understand various types of water losses and their measurement
4 Determine run-off from a catchment
5 Understand different types of hydrographs, derivation of unit hydrograph from flood hydrograph and derivation of flood hydrograph from unit hydrograph
6 Understand various types of stream gauging methods, estimate peak flood for a given basin

D RECOMMENDED TEXTBOOKS

1 Hydrology – Principles, Analysis, Design by H M Raghunath, New Age International Publishers

E REFERENCE BOOKS

1 Engineering Hydrology by K Subramanya, Mc-Graw Hill Publications (India) (P) Ltd.
2 A Text Book of Hydrology by P JayaRami Reddy, Laxmi Publication (P) Ltd., New Delhi
3 Applied Hydrology by K N Mutreja, Tata Mc-Graw Hill Company Ltd.
4 A Text Book of Hydrology and Water Resources by R K Sharma, Dhanpat Rai and Sons.
5 Water Resources Engineering by Larry W Mays, John Wiley and Sons, Inc.
6 IS 4987- 1994: Recommendations for establishing net work of rain gauge stations
7 IS 4986 - 2002: Installation of Rain gauge (Non-Recording Type) and Measurement of Rain - Code of Practice
8 IS 1192 – 1981 – Velocity – Area methods for measurement of flow of water in open channels
9 IS 3918 – 1966 – Code of practice for use of current meter (cup type) for water flow measurement
10 IS 5973-1970- Pan Evaporimeter (Amendment no.3) (Reaffirmed 1990)
11 IS 6509-1971- Recommendation for liquid flow measurement in open channels by weirs and flumes – weirs of finite crest width for free discharge (Reaffirmed 1990)

12 IS 6062 - 1971: Method of Measurement of Flow of Water in Open Channels Using Standing Wave Flume-fall (reaffirmed 1989)
13 IS 6063- 1971: Method of measurement of flow of water in open channels using standing wave flume (reaffirmed 1989)
14 IS 6939: 1992-Methods for determination of evaporation from reservoirs
15 IS 8389: 2003-Installation and Use of Rain gauges, Recording - Code of Practice
16 Handbook of Hydrology by David R Maidment, Mc-Graw Hill Inc.
17 Handbook of Applied Hydrology by Vijay P. Singh, Mc-Graw Hill Education

List of open source learning websites

http://nptel.ac.in/courses/105101002/
http://nptel.ac.in/courses/105104103/
http://nptel.ac.in/downloads/105105110/

(CL616) DESIGN OF STRUCTURES-II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
04	00	02	60	40	25	25	150	04	00	01	05

A OBJECTIVES OF THE COURSE

To make students familiar with the design of Reinforced Concrete and Steel structures.

B DETAILED SYLLABUS [Hr]

(I) DESIGN OF REINFORCED CONCRETE STRUCTURES

1 LOADS **[01]**

Loading Standards as per BIS, Distribution of Loads, Computation of Wind Load and Earthquake Forces, Combination of Loads

2 STRUCTURAL LAYOUT FOR BUILDINGS **[03]**

Continuous Beam, Typical Floor Design including Two ways Continuous Slab.

3 DESIGN OF COLUMNS **[04]**

Short and Slender Columns with Uniaxial and Biaxial Bending.

4 DESIGN OF FOOTINGS **[06]**

Combined Footing and Raft.

5 STRUCTURES **[10]**

Cantilever Shed, Portal Frames, Rectangular Water Tanks, Retaining wall

(II) DESIGN OF STEEL STRUCTURES

1 CONNECTIONS **[03]**

Unstiffened, Moment and Shear resisting Structural Connections. Design and detailing of connection between Roof Truss to Column, Column to Beam, Beam to Beam and Truss to Bed Block.

2 DESIGN OF ROOF TRUSSES **[06]**

Various types of Trusses and their selection in Industrial Structures. Effect of Wind & EQ or other loads on Trusses, Structural Detailing. Monitored and Knee-Braced Trusses.

3 DESIGN OF BEAM COLUMN: **[03]**

Design of members subjected to combined actions, bending with compression/tension.

4 DESIGN OF STEEL STRUCTURES: **[12]**

Cantilever Shed, Plate Girder, Industrial Building (Rolled/Tubular) including Gantry
Girder, Through and Deck Type Bridges.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Students will be able to handle basic RCC and Steel Structures design as per Limit State Method.

D RECOMMENDED TEXTBOOKS

1 Reinforced Concrete Design by S Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill Publication

2 Design of Steel Structures by N. Subramanian, Oxford Publication

E REFERENCE BOOKS

1 Design of RCC Structures Vol-II by H. J. Shah, Charotar Publication

2 Reinforced Concrete Design by S. N. Sinha, McGraw Hill Education; Thirdedition.

3 Design of RCC Structures by P. C. Varghese, PHI Publications

4 Limit State Design of Steel Structures, S. K. Duggal, Mc Graw Hill Publications.

5 Design of Steel Structures, Arya & Ajmani, Nemchand & Sons Publications.

6 Design of Steel Structures, S. Ramamrutham, Dhanpatrai Publishing Company.

7 IS 456:2000 (Reaffirmed 2005), Plain and Reinforced Concrete - Code of Practice (Fourth Revision)

8 IS 800:2007, General Construction in Steel – Code of Practice (Third Revision)

9 IS 875 (Part 1): 1987, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures (Dead Loads)

10 IS 875 (Part 2): 1987, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures (Imposed Loads)

11 IS 875 (Part 1): 2015, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures (Wind Loads)

12 SP24, Explanatory Handbook on Indian Standard Code of Practice for Plain and Reinforced Concrete Structures.

13 SP16, Design Aids for Reinforced Concrete Structures.

14 SP34, Handbook on Concrete Reinforcement and Detailing

F LIST OF TUTORIALS TO BE PERFORMED UNDER THIS SUBJECT HEAD.

Tutorials no.	Name of Tutorials
1	Orientation Exercise
2.	Design of RCC Slabs
3.	Design of RCC Footings
4.	Design of RCC Columns
5.	Design of Cantilever Retaining Wall
6.	Connection Design
7.	Design of Steel Truss
8.	Design of Plate Girder
9.	Design of Gantry Girder
10.	Design of Beam Column.

(CL617) CONSTRUCTION TECHNOLOGY-II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	00	00	60	40	-	-	100	03	00	00	03

A OBJECTIVES OF THE COURSE

- To create awareness about advanced construction practices for Sub Structure & Super Structure of heavy structures under various conditions.
- To give knowledge of various construction equipments & their selection criteria.

B DETAILED SYLLABUS **[Hr]**

1 Introduction: **[02]**

Role of Construction equipment in Engineering Projects. Standard equipment and special equipment, Benefits of Equipment.

2 Earth Moving Equipment **[10]**

Engineering fundamentals of earth moving equipment's like Rolling and Grade resistance, Coefficient of Traction, Effect of altitude and temperature on performance, Rim pull and Drawbar pull etc.

Wheel and Crawler mounted equipment's and its operations, types, use and output of: Bulldozers, Scraper, Dragline, Power shovel, Excavator (Hoe) Trencher, Material handling equipment's, Compaction equipment's.

3 Concrete Equipment's **[04]**

Equipment's for concrete production- Mixers, Transit mixers, batching plant - Ready mix concreting etc.,

Concrete Transportation & Placing Systems-Concrete pumps etc, Various tools for Concreting work & Compaction works

4 Coffer Dam, and Caisson **[04]**

Coffer Dam: Type, Use and Selection of Coffer Dam, Forces acting on a coffer dam, Economical height, leakage problems

Caisson: Classification, use and selection criteria of caissons, Transportation, launching and sinking of various caissons, Construction problems Diaphragm wall: Introduction & Construction Methodology

5 Excavation Support System **[02]**

Introduction to excavation support systems- Diaphragm wall, Soil nailing etc., Construction methodologies, Advantages & Uses

6 Ground water Control During Excavation **[02]**

Importance, Selection Criteria, Various methods: Sump, Bore-well, well points, Electro osmosis, Grouting, Freezing, shotcrete etc.

7 Form Work **[04]**

Materials &arrangement System for Formwork, Formwork for foundations, columns, beams, walls etc.

8 Economic Analysis of Equipment **[08]**

Time value of money concept, Replacement Analysis, Owning & Operating Cost, Buy, Rent, Lease Concept, Economic & Physical life of equipment

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1. Understand various advanced techniques and construction methodology prevailing in construction practices.
2. Identify suitable construction equipments for any activity and their economic selection.
3. Select appropriate method for from work systems

D RECOMMENDED TEXTBOOKS

1. Construction Planning, Equipment by Peurifoy, L., Schexnayder, C.J. and Shapira, McGraw Hill, New Delhi, 8th Edition, 2010
2. Construction Equipment and its planning and application by Dr. Mahesh Verma, Metropolitan Book Company, New Delhi,2003

E REFERENCE BOOKS

1. Construction Equipment and Management by S.C. Sharma, Khanna Publication, New Delhi,2003
2. Construction Technology by Shankar S.K, Saraswati S, Oxford University Press, New Delhi,2008
3. CWC guidelines on Equipment for river valley projects
4. IS 4926 : Code of practice for Ready Mix concrete
5. IS 14687 (1999): Guidelines for falsework for Concrete
6. Formwork of Concretes: Basic Design Principles and Construction Methods (3rd Edition) by C.K. Austin, Trans-Atlantic Publications

(AF602) PROFESSIONAL COMMUNICATION II

Teaching Scheme			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lec	Tut	Prac	Total
1	0	2	50	-	-	50	100	1	-	1	2

A. OBJECTIVES OF THE COURSE

1. To develop confidence in the students for communicating at workplace.
2. Develop their Listening, Speaking, Reading, and Writing Skills.
3. To give exposure of communicating with public.
4. How to develop fluency in English Language.
5. To prepare students for placement.
6. To teach how to be effective at the job.

B. DETAILED SYLLABUS

1. COMMUNICATION SKILLS:

Intrapersonal Communication, Interpersonal Communication Importance of Empathy in Communication, Psychological Dealings in Communication Positive Attitude,

2. TEAM BUILDING:

Introduction, Meaning and importance of team, Skills and qualities of a team member, Techniques to be a good team member, Working in Groups, Leadership Qualities,
Negotiation Skills, Adjustment level and Flexibility, Understanding Team mates

3. EFFECTIVE SELF PRESENTATION THROUGH LSRW:

Listening -active listening, Speaking, Indianism Presentation Reading Speed Reading Reading Practice Levels of Comprehension (Evaluative and Applied) Comprehension practice Writing Minutes Notice Proposal Report Writing

C. LEARNING OUTCOMES:

After completion of this course students will be able to understand:

1. Psychological aspects in communication
2. Developing Positive Attitude and empathy
3. Importance of team and how to work in a team
4. Effective Listening, Reading, Writing and speaking skills
5. Corporate Communication
6. Writing Minutes, Notice, Proposal and Report
7. Competence in writing and reading

D. RECOMMENDED TEXTBOOKS

1. Meenakshi Raman, Sangeeta Sharma. *Technical Communication*: *Principles and Practice*; Oxford University press: New Delhi, 2004.

2. Meenakshi Raman, Prakash Singh. *Business Communication: Second edition;* Oxford University Press: New Delhi, 2012.

3. Steve Hart, Arvind R. Nair, Veena Bhambhani. *Embark: English for Undergraduates;* Cambridge University Press: Delhi, 2016.

A. REFERENCE BOOKS

2. T M Farhathullah. *Communication Skills for Technical Students;* Orient Longman Private Ltd.: Chennai, 2002.

Elective -1 (CL618) FINITE ELEMENT METHODS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	01	00	60	40	25	00	125	03	01	00	04

A OBJECTIVES OF THE COURSE

To provide the fundamental concepts of the theory of the finite element method.

To develop proficiency in the application of the finite element method

B DETAILED SYLLABUS [Hr]

1 Introduction to FEM, Elements of Theory of Elasticity, concept of stress strain, elastic constant. **[04]**

2 Plane stress, plane strain and Axi-symmetric element. **[02]**

3 Principles of discretization, direct stiffness method, variational formulation and weighted residual techniques. **[02]**

4 Element stiffness matrix formulation for column/truss element and beam element. **[04]**

5 Element stiffness matrix formulation for triangular element and rectangular element. **[06]**

6 Shape function of 1 D & 2 D element using Natural co-ordinate system. **[05]**

7 Shape function using Lagrange and Hermitian polynomials **[04]**

8 Isoparametric elements and their application. **[05]**

9 Degrading technique for constructing of shape functions. (missing / reduced node) **[02]**

10 Computerization and use of application software. **[02]**

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Interpret the philosophy behind principles, design and modelling considerations in using finite element analysis.

2 Describe the general steps used in the finite element analysis to model problems in engineering.

3 Develop stiffness matrices for truss, beam, plane stress problems and two-dimensional problems.

4 Create and design engineering structures using finite element methods.

D RECOMMENDED TEXTBOOKS

1 Finite Element Analysis BY C.S.Krishnamoorthy Publisher- Tata McGraw Hill

E REFERENCE BOOKS

1 Introduction to Finite Element Method By Desai C.S.and Ables J.F.

2 Introduction to Finite Elements in Engineering By Chandraputla & Belegundu Publisher:- Prentice-Hall (India)

3 Finite Element Procedures in Engineering Analysis By Klaus-Jürgen Bathe Publisher: - Prentice-Hall (India)

4 Concepts and Applications of Finite Element Analysis By Cook R.D.

F LIST OF TUTORIALS TO BE PERFORMED UNDER THIS SUBJECT HEAD.

Tutorials no.	Name of Tutorials
1	Introduction to DSM
2.	Theory of Elasticity
3.	1 Dimensional Element
4.	2 Dimensional Element
5.	Natural co-ordinate system
6.	Shape function using Lagrange and Hermitian polynomials
7.	Isoparametric elements

Elective 2 (CL619) BUILDING REPAIRS & REHABILITATION

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	01	00	60	40	25	00	125	03	01	00	04

A OBJECTIVES OF THE COURSE

To teach the importance of durability of structure and introducing causes of deterioration of structures & To introduce the students in depth about knowledge of professional practice of repair techniques with right selection of repairing material.

B DETAILED SYLLABUS [Hr]

1 Durability of Buildings **[09]**

Life expectancy of buildings serviceability and Durability, Maintenance and Repair strategies, Estimation of building strength and durability, Effects of environmental elements on buildings

2 Maintenance of Buildings **[09]**

Preventive and corrective maintenance, scheduled and contingency maintenance planning, Maintenance standards, Maintenance cost, Prevention of Dampness, fire and termites, Maintenance and repair of construction joints

3 Failure & Repair of Building **[09]**

Type of failure, Investigation of failure, testing methods, Material for repair, Techniques for repair, Repair of concrete and masonry elements, Repair and strengthening of foundations, Flooring and roofs

4 Rehabilitation of Buildings **[09]**

Analysis, Planning, cost estimates, Rehabilitation

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Student will be able to get a diverse knowledge of concrete deteriorating mechanisms, repairs methods and its tools to enhance his professional practice, which will be use full in tackling repairs problems in construction industry.

D RECOMMENDED TEXTBOOKS

1 Deterioration and maintenance and repair of building by S.M.Jhonsons McGraw Hill, New Delhi

2 Handbook on Repairs and Rehabilitation of structures, CPWD, Delhi

E REFERENCE BOOKS

Repairs of concrete structures by R.T.Allen and S.C.Edwards, Balki and sons, UK

Elective 3 (CL611) PRESTRESSED CONCRETE

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	01	00	60	40	25	00	125	03	01	00	04

A OBJECTIVES OF THE COURSE

To make students familiar with the fundamentals Prestressed Concrete and learn design of Prestressed Concrete Sections.

B DETAILED SYLLABUS [Hr]

1 INTRODUCTION: [04]
Development of Prestressed concrete, Classification of Types of Prestressing, Losses in Prestress.

2 FLEXURAL STRENGTH OF PRESTRESSED CONCRETE SECTION: [06]
Types of Flexural Failure, Strain Compatibility Method, Simplified Code Procedures.

3 LIMIT STATE DESIGN OF PRESTRESSED CONCRETE STRUCTURES: [18]
Introduction, Criteria for Limit States, Design Loads and Strength, Strength and Serviceability Limit States, Crack widths in Prestressed Members.
Design of Sections for Flexure, Axial Tension, Compression and Bending, Shear & Torsion.

4 DESIGN OF END BLOCK [04]

5 DEFLECTION OF PRESTRESSED CONCRETE MEMBER: [0]
Factors influencing deflection, Short-Term deflection of uncracked members, Prediction of Long time deflection.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 At the end of this course, students will be well versed with philosophy and use Prestressed Concrete and they will to handle element design of PSC Structures.

D RECOMMENDED TEXTBOOKS

1 “Concrete technology” by A.N.Neville & J.J.brooks ELBS publication,1987

E REFERENCE BOOKS

1 Design of Prestressed Concrete Structures by Lin and Burns, Willey Publication
2 Prestressed Concrete Design by Pandit and Gupta, S. Chand Publication.
3 Limit State Design of Prestressed Concrete Structure by Mallick and Gupta, Oxford and IBH Publication.
4 IS 1343 : 2012, Prestressed Concrete - Code Of Practice

Approximate 25 examples based on the topics including mix design and an internal seminar by each student for special concrete applications

Elective -4 (CL620) DESIGN OF HYDRAULIC STRUCTURES

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	01	00	60	40	25	00	125	03	01	00	04

A OBJECTIVES OF THE COURSE

Impart knowledge regarding various hydraulic structures, Impart the knowledge of causes of failure, design criteria and stability analysis of embankment dam, Impart the knowledge of various forces acting on a gravity dam and stability analysis of gravity dam, Impart the knowledge to find out storage capacity of spillway and design aspects of various types of spillways, Impart the knowledge of various types of diversion head works and their hydraulic design, Impart the knowledge of various types of canal regulation works, Impart the knowledge of various types of cross drainage works and their hydraulic design

B DETAILED SYLLABUS [Hr]

1 INTRODUCTION TO DAM ENGINEERING [02]

Introduction, Classification of dams, Types of dams, Factors governing selection of type of a dam, Selection of a site for a dam, Preliminary and final investigations of a dam site.

2 EMBANKMENT DAMS [06]

Types of earth dams, Foundation requirements, Causes of failures, Criteria for safe design of earth dams, Preliminary section of earth dam, Typical cross-section of earth dams, Checking the stability of earth dam, Seepage analysis, Phreatic line in an earth dam, Flow nets construction, Slope-stability analysis, Location of most critical circle, Seepage control measures in dam and foundation, Design of impervious blanket, Drainage of earth dams, Design of filters, Surface protection of upstream and downstream face, Design considerations in seismic regions, Rock fill dams.

3 GRAVITY DAM [06]

Forces acting on a gravity dam, Load combinations for a design of a gravity dam, Stability requirements, Principal and shear stresses, Elementary and practical profile of a gravity dam, Analysis of a gravity dam, Design of a gravity dam by single step and multiple step method, Strip method of design of high dam, Joints, keys, water stops and galleries in a gravity dam, Temperature control in a dam, Adits, vaults and shafts, Construction of a gravity dam, Foundation grouting, Instrumentation in dams.

4 SPILLWAYS [03]

Essential requirements of a spillway, Required spillway capacity, Component parts of a spillway, Classification of spillways, Free overfall spillway, Ogee spillway, Chute spillway, Side channel spillway, Shaft spillway, Siphon spillway, Priming devices, Conduit spillway, Culvert spillway, Cascade spillway, Energy dissipation below spillways, Characteristics of hydraulic jump, Locations of hydraulic jump, Measures adopted for dissipation of energy, Stilling basins, Spillway crest gates.

5 DIVERSION HEADWORKS [06]

Introduction, Types of diversion headworks, Location of canal headworks, Components of diversion headworks, Layout of diversion headworks, Theories of sub-surface flow, Bligh's creep theory, Lanes's weighted creep theory, Khosla's theory of independent variables, Design of diversion headworks, Basic factors for design, Effect of construction of weir on river regime, Causes of failures of weirs on permeable foundations, Silt control devices, River training works.

6 DAM OUTLET WORKS **[02]**

Location of dam outlets, Classification of outlets, Component parts of outlet works, Discharge through an outlet, required capacity of an outlet, Trash rack, Intake structures,

7 CANAL REGULATION WORKS **[06]**

Introduction, Definition of falls, Necessity and location of falls, Classification of falls, Types of cisterns, roughening devices, Design of Trapezoidal notch fall, Design of Sarda type fall, Design of Straight glacis fall, Design of Montague type fall, Inglis type fall, Offtake alignment, Design of cross regulators and distributary head regulators, Selection of type of fall, Devices to control.
silt entry into the off taking canal, Bed bars, Escapes, Necessity and types of escapes.

8 CROSS DRAINAGE WORKS **[05]**

Introduction, Types of cross drainage works, Selection of a suitable type of cross drainage work, Selection of a site for cross drainage works, Features of design of cross drainage works, Determination of maximum flood discharge, Determination of water way of a drain, Head loss through syphon barrels, Contraction of canal water way (fluming), Design of bank connections.

Relevant computer programs / tools to be used in respective chapters.

C LEARNING OUTCOMES

On the completion of the course the students should be able to:

1 Perform stability analysis of gravity dam
2 Understand causes of failure of different types of earth dams and their design criteria
3 Design gravity dam
4 Design of spillway
5 Design of diversion head works
6 Design irrigation structures such as regulators, cross drainage works and canal falls

D RECOMMENDED TEXTBOOKS

1 Irrigation, Water Power and Water Resources Engineering by K R Arrora, Standard Publishers Distributors.

E REFERENCE BOOKS

1 Irrigation, Water Resources and Water Power Engineering by P N Modi, Standard Book House
2 Irrigation Engineering and Hydraulic Structures by S K Garg, Khanna Publishers.
3 Irrigation and Water Power Engineering by B C Punmia and Pande B B Lal, Laxmi

4 Publications (P) Ltd., New Delhi
5 Fundamental of Irrigation Engineering by Bharat Singh, Nem Chand and Brothers, Roorkee.
6 Irrigation and Water Resources Engineering by G L Asawa, New Age Int. Ltd.
7 Design of Irrigation Structures by S K Sharma, S. Chand & Company (Pvt.) Ltd.,
8 Hydraulic design handbook by Mays, L. W. McGraw-Hill
9 Irrigation Engineering and Hydraulic Structures by S R Sahasrabudhe, S K Kataria
10 IS 6512 – 1984 : Criteria for design of solid gravity dams
12 IS 4997-1968 : Criteria for design of hydraulic jump type stilling basins with
13 horizontal and sloping aprons (reaffirmed 1991)
14 IS 5477- Methods for fixing capacity of reservoirs : Part-I : 1969: General
15 requirements (Reaffirmed 1990); Part – II: 1969: Dead Storage (Reaffirmed 1990) ; Part – III:1969: Live storage (Reaffirmed 1990); Part – IV: 1971: Flood
16 storage(Reaffirmed 1990)
17 IS 6531 – 1992- Canal Head Regulators - Criteria for Design
IS 6934 – 1973-Recommendations for hydraulic design of high ogee overflow
18 spillways
19 IS 6955: 2008-Subsurface exploration for earth and rockfill dams - Code of practice
20 IS 6966-1: 1989-Hydraulic design of barrages and weirs - Guidelines, Part 1: Alluvial Reaches
21 IS 7112: 2002-Criteria for Design of Cross-Section for Unlined Canals in Alluvial Soil

List of open source learning websites

- https://www.slideshare.net/gauravhtandon1/design-of-hydraulic-structures-
- nptel.ac.in/courses/105105110/pdf/m4l06.pdf

F LIST OF TUTORIALS TO BE PERFORMED UNDER THIS SUBJECT HEAD.

Tutorials no.	Name of Tutorials
1	Calculation of forces acting on gravity dam
2.	Stability analysis of gravity dam
3.	Design of Gravity dam
4.	Design of Spillway
5.	Location of phreatic line in earth dam section with horizontal filter and without filter
6.	Stability analysis of earth dam
7.	Design of Sarda Type Fall
8.	Determination of uplift pressure at key points in weir or barrage
9.	Design of aqueduct and syphon aqueduct
10.	Design of super passage and Syphon

(CL710) IRRIGATION AND HYDRAULIC STRUCTURES

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
03	02	00	60	40	25	00	125	03	02	00	05

A OBJECTIVES OF THE COURSE

- Types of irrigation systems and irrigation efficiencies
- Different crop seasons and optimum utilization of irrigation water
- Design of irrigation canals by different methods
- Different types of diversion headworks
- Theories of seepage and design of weirs and barrages
- Canal regulators, canal modules and other miscellaneous canal structures
- Cross drainage works
- Dams in general and gravity dam and earth dam in particular

B DETAILED SYLLABUS

[1] IRRIGATION **[02]**

Definition of irrigation, necessity of irrigation in India, advantages of irrigation and disadvantages of over-irrigation, types of irrigation, techniques of water distribution in farms, quality of irrigation water, water logging problems.

[2] WATER REQUIREMENTS OF CROPS **[04]**

General, crop period and base period, duty and delta, importance of duty, measures to improve duty, crop seasons, optimum utilization of irrigation water, irrigation efficiencies, consumptive use, consumptive irrigation requirement and net irrigation requirements, estimation of consumptive use, soil – moisture relationship, estimating depth and frequency of irrigation on the basis of soil moisture regime concept.

[3] CANAL IRRIGATION SYSTEM **[02]**

General, alluvial and non-alluvial canals, alignment of canals, distribution system for canal irrigation, certain definitions, computing design capacity of irrigation canal, canal regulation, Warabandhi system.

[4] DESIGN OF IRRIGATION CANALS **[04]**

Design of stable channels in India by Kennedy's and Lacey's approach, design of canal on alluvial soils and non-alluvial soils, use of Garret’s diagrams, use of Lacey’s regime diagrams and canal lining, design of canals by tractive force approach, cross – section of an irrigation canal, balancing depth of excavating canal.

[5] DIVERSION HEADWORKS **[04]**

Introduction, purpose, weirs and barrages types, causes of failures, layout of diversion headworks.

Bligh's and Khosla's theory, component parts, Design of vertical drop weir.

[6] CANAL FALLS **[02]**

Definition and location, types of falls, design of - trapezoidal notch fall, simple vertical drop fall, Sarda type fall, straight glacis fall.

[7] REGULATORS, MODULES AND OTHER MISCELLANEOUS CANAL STRUCTURES **[05]**

Canal regulation and canal regulation works, alignment of off-taking canal, distributary head regulator and cross regulator, silt control, location of head works, retrogression, types of canal escapes, types of metering flumes, requirements of good canal outlet, types of outlets, criteria for judging performance of outlets.

[8] CROSS DRAINAGE WORKS **[03]**

Definition, types of cross – drainage works, selection of suitable type of cross – drainage work, design considerations for cross – drainage works.

[9] GRAVITY DAMS **[04]**

Dams in general, various types of dams, problems in dam construction, selection of type of dam and their classification, factors governing selection of particular type of a dam, selection of a dam site, gravity dam, forces acting on a gravity dam, modes of failures and criteria for structural stability of gravity dams, elementary and practical profile of a gravity dam, high and low gravity dams, design of High and low gravity dam; galleries, joints, keys and water seals.

[10] EARTHEN DAMS **[04]**

Introduction, types of earthen dams, methods of construction, causes of failures of earthen dams, design criteria for earth dams, selecting a suitable preliminary section of an earth dam, phreatic line in earth dam, stability of earth slopes, seepage control through embankments and foundations of earth dams, design of filters, slope protection, rockfill dam.

[11] SPILLWAYS **[02]**

Necessity and types, energy dissipation and scour protection devices, I.S.I criteria for design of hydraulic jump type stilling basins with horizontal and sloping aprons, crest gates, outlet works.

[12] COMPUTER APPLICATIONS TO SPECIFIED PROBLEMS

C LEARNING OUTCOMES

- Understand necessity of irrigation in India and various types of irrigation systems
- Understand various types of irrigation efficiencies and determine net irrigation requirements (NIR), field irrigation requirements (FIR) and gross water requirements (GIR)
- Design irrigation canals

- Understand the importance of diversion head works and to determine uplift pressure at key points of a hydraulic structure
- Understand functions of canal falls, canal escapes, regulators and modules
- Understand functions of cross drainage works
- Design of gravity and earth dams

D RECOMMENDED TEXTBOOKS

1) Irrigation Engineering and Hydraulic Structures by S K Garg, Khanna Publishers.

E REFERENCE BOOKS

1) Irrigation, Water Resources and Water Power Engineering by P N Modi, Standard Book House
2) Irrigation, Water Power and Water Resources Engineering by K R Arrora, Standard Publishers Distributors.
3) Irrigation and Water Power Engineering by B C Punmia and Pande B B Lal, Laxmi Publications (P) Ltd., New Delhi
4) Fundamental of Irrigation Engineering by Bharat Singh, Nem Chand and Brothers,

List of open source learning websites
http://nptel.ac.in/courses/105102159/
http://nptel.ac.in/downloads/10510511/

(CL711) PROFESSIONAL PRACTICE AND VALUATION

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3.0	0.0	1.0	4.0

A OBJECTIVES OF THE COURSE

- To build the professional skills, construction procedures and knowledge on valuation techniques and property analysis.

B DETAILED SYLLABUS [Hr]

[1] ESTIMATES [04]

Necessity and types, Approximate and detailed estimates, methods and Uses.

[2] SPECIFICATIONS [04]

Definition, objects and Importance, Requisites of good specification, classification of specifications, Standard specifications, Specifications of some important typical items.

[3] RATE ANALYSIS [03]

Purpose, factors affecting rate analysis, SOR, Task works per day, rate of material and labour, rate analysis of typical items

[4] CONDITIONS OF CONTRACT [04]

Definition, object, importance, general provisions, typical conditions of contract.

[5] CONTRACTS [06]

Meaning and Importance, Essential requirements of a contract, Types of contract- Labour contract, Negotiated contract, SOR contracts, contract documents, termination of contract, responsibilities of the engineer, the contractor and client, earnest money and security deposits.

[6] TENDER [02]

Meaning, Opening, Scrutiny and acceptance of tenders, Revocation of tender, unbalanced tender, liquidated damages.

[7] ARBITRATION [02]

Definition, Arbitrator and referee, types of arbitration, powers of an arbitrator, process of arbitration, advantages of arbitration.

[8] RATE ANALYSIS [02]

Purpose, factors affecting rate analysis, SOR, Task works per day, rate of material and labour, rate analysis of typical items

[9] VALUATION **[05]**

Purposes, Cost - price - value, Different forms of value, Freehold and leasehold properties, Sinking fund, Amortization, depreciation and obsolescence, Capitalized value and year's purchase, Interest rates, Ideal investment, Mortgage, Annuity, Methods of valuation.

[10] WORKS AND STORES ACCOUNTING **[04]**

Stores, Vouchers and receipts, Capital works and repair works, Administrative approval and technical sanction, Measurement book, Muster roll, Daily reports, Imp rest, Advance payments, Work-charged establishments, Inventory

C LEARNING OUTCOMES

- Critically analyse and apply industry professional knowledge, theoretical, methodological and ethical concepts in valuation practices.
- Critically analyse and synthesise property data to undertake an evidenced based market analysis.
- Analyse and synthesise property data and trends to determine property value for a commercial or specialised property

D RECOMMENDED TEXTBOOKS

1) Estimation and Costing by Rangwala, Charotar Publications
2) Estimating & Costing in Civil Engineering Theory & Practice by B.N. Dutta, UBSPD.

E REFERENCE BOOKS

1) Estimating & Costing in Civil Engineering Theory & Practice by B.N. Dutta, UBSPD.
2) Estimation, Costing and Accounts by D.D. Kohli, S. Chand & Co
3) Textbook of Estimating and Costing (Civil Engineering) by G.S. Birdie, Dhanpat Rai Publications.

(CL712) FOUNDATION ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	2	0	60	40	25	0	125	4	2	0	6

A OBJECTIVES OF THE COURSE

- To build the necessary theoretical background for design and construction of foundation systems..

B DETAILED SYLLABUS [Hr]

[1] INTRODUCTION [01]

Different types of footings, Suitability of foundation on different soil types, difference between shallow and deep foundation, factors governing the choice of soil type.

[2] BEARING CAPACITY OF SHALLOW FOUNDATIONS [12]

General requirements of satisfactory performance of foundation, basic terminologies, types of soil failures, Bearing capacity theories (Shear Criteria): Prandtl's, Rankine's, Terzaghi's, Meyerhoff's, IS code on sand and clay,

Bearing capacity (Settlement Criteria) from Standard Penetration Test, Bearing capacity from Plate Load Test, Calculation of Total settlement: immediate, consolidation and differential.

[3] BEARING CAPACITY OF RAFT OR MAT FOUNDATION [03]

Introduction, Combined footings, Common types of Mat foundation, Bearing capacity of mat foundation, Compensated foundation

[4] PILE FOUNDATION [12]

Introduction, Classification of pile, Load transfer mechanism, Methods for determining bearing capacity of single pile: Static equation for estimating pile capacity, Dynamic formulae (Engineering New's Formula, IS code method), Pile Load Test on sand, clay and layered soil, Efficiency of pile group, Bearing capacity of pile group in clay and sand, pile group settlement, Negative skin friction.

[5] UNDER-REAMED PILE [04]

Introduction, Installation method, Bearing capacity of under-reamed pile

[6] FOOTINGS ON COLLAPSIBLE SOIL [02]

General consideration, significant characteristics of collapsible soil, design of foundation on un-wetted collapsible soils and soils subjected to wetting, treatment methods for collapsible soils..

[7] FOOTINGS ON EXPANSIVE SOIL [02]

General consideration, significant characteristics of expansive soil, clay mineralogy and mechanism of swelling, design of foundation in expansive soil, treatment methods for expansive soils

[8] CAISSON FOUNDATION [04]

Introduction, Types of caissons, stability analysis of caissons, Determination of Scour depth in cohesionless soils, thickness of steining of well.

[9] GROUND IMPROVEMENT TECHNIQUES [08]

Necessity for ground improvement, Field compaction, vibroflotation, Sand drains, Wick drains, Soil stabilisation using admixtures.

C LEARNING OUTCOMES

- Students will be able to design shallow foundation with shear and settlement criteria.
- Students will be able to design pile foundations and caissons,
- Students will be able to design foundation on critical soils and study different ground improvement techniques.

D RECOMMENDED TEXTBOOKS

1) Soil Mechanics and Foundation engineering by B.C.Punamia, Laxmi Publishers
2) Soil Mechanics and Foundation Engineering by VNS Murthy, CBS publishers

E REFERENCE BOOKS

1) Principles of Foundation Engineering by Brija M. Das, Cengage Learning
2) Soil Mechanics and Foundation Engineering by K. R. Arora, Rajsons publications
3) Soil Mechanics and Foundation Engineering by P. Purushothama Raj, Pearson education
4) Foundation Design and Construction by M.J.Tomlinson, Longman Singapore Publishers (Pte) Ltd.
5) Foundation Analysis and Design by Joseph E. Bowles, McGraw – Hill Companies Inc.
6) Pile Foundation Analysis and Design, H. G. Poulos & E. H. Davis, John Wiley and Sons, Inc. Canada
7) Morden geotechnical Engineering by Alam singh, CBS Publishers & Distributors
8) Foundation Design, Principles and Practices by Donald P. Coduto, Prentice Hill, Upper Saddle River, New Jersey.
9) IS: 6403 – 1981 Code of practice for determination of bearing capacity of shallow foundations
10) IS:8009 - 1976 Code of practice of settlements of foundations
11) Part 1: Shallow foundation subjected to symmetrical static vertical loads Part 2: Deep foundations subjected to symmetrical static vertical loading

12) IS 2911 (Part 1 to 4) - 2010 Practice for design and construction of pile foundations
13) IRC 78 – 2014 Standard specifications and code of practice for Road Bridges, Section- VII: Foundations and Substructure.
14) IS 15284 (Part 1) – 2003 Design and Construction for Ground Improvement — Guidelines (Stone Columns)
15) IS 15284 (Part 2) - 2004 Design and Construction for Ground Improvement — Guidelines (Preconsolidation using Vertical Drains)
16) SP-36-1: Compendium of Indian standards on soil Engineering: Part-1 Laboratory testing of Soils for civil Engineering Purpose.
17) SP-36-2: Compendium of Indian standards on soil Engineering: Part-2 field testing of Soils for civil Engineering Purpose.

(CL713) CONSTRUCTION MANAGEMENT AND ECONOMICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	125	4	0	0	4

A OBJECTIVES OF THE COURSE

- To make students familiar with the basics of Construction management, project planning and allocation

B DETAILED SYLLABUS [Hr]

[1] INTRODUCTION [02]

Construction Industry in India:
Construction & Economy - Requisites for successful contractor. Requisites for profitable construction business.

[2] ORGANISATION & MANAGEMENT [03]

Organization: Types, Principles, Suitability. Management: Principles, Functions, Benefits. Management Information Systems and Techniques.

[3] CONSTRUCTION PLANNING [12]

Necessity, factors points to be taken care of- Mobilization - Resources planning- scheduling phasing of work, CPM procedures, calculation for floats-updating of network time-grid diagram time-cost optimization. Resources allocation - Resources leveling.

[4] PROGRAM EVALUATON & REVIEW TECHNIQUE PERT [04]

Time concept, Calculations-frequency distribution curves

[5] FINANCIAL ANALYSIS [08]

Financial comparisons of alternatives & Different cost-its implications, decision making Benefits of financial analysis

[6] CONSTRUCTION LABOUR MANAGEMENT [08]

Welfare-efficiency-Training-System of wages-Incentive plans

[7] CONSTRUCTION MATERIAL MANAGEMENT [06]

Material planning-storage - inventory control systems advantages material accounting - order quantity- Different concept of analysis - Determination of safety stock level

[8] MANAGEMENT INFORMATION SYSTEMS AND SAFETY IN CONSTRUCTION [05]

Time concept, Calculations-frequency distribution curves

C LEARNING OUTCOMES

- At the end of this course, the students will have the knowledge about the construction planning & scheduling procedures for a project. The students will gain knowledge about the type of contract systems to be selected for construction projects.

D RECOMMENDED TEXTBOOKS

1) Construction Project Management by K K Chitkara, Tata McGraw-Hill publication.
2) Construction Project Management – Theory and Practice by Kumar Neeraj Jha, Pearson publication.

E REFERENCE BOOKS

1) Construction Planning, Equipment and Methods by Robert Peurifoy, William Ledbetter and Clifford Schexnayder
2) Construction Engineering & Management by Seetharaman, S., Umesh Publications
3) Project Planning and Control with PERT and CPM by B. C. Punamia and Khandelwal, Laxmi Publications

(CL714) HIGHWAY ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

A OBJECTIVES OF THE COURSE

- To establish the understanding of fundamental concepts of highway engineering. To build the necessary theoretical background for the design and construction of highway.

B DETAILED SYLLABUS [Hr]

[1] INTRODUCTION [03]
Importance of transportation, Modes of transportation, Roles of Transportation, Scope of highway engineering

[2] HIGHWAY ALIGNMENT [03]
Highway Alignment, Engineering Surveys & Preparation of detailed report

[3] GEOMETRIC DESIGN OF HIGHWAYS [12]
Importance of geometric design, highway cross sectional elements, sight distance, design of horizontal and vertical alignment, highway capacity

[4] HIGHWAY MATERIALS [04]
Physical and Mechanical Properties of Soil, Stone aggregates, Bitumen binders, and Bitumen paving mixes; Bituminous mix design

[5] HIGHWAY CONSTRUCTION [04]
General features, Stages of construction, Earthwork, Soil stabilization, Bitumen Pavement Construction & Cement Concrete Pavement construction

[6] PAVEMENTS [03]
Types of Pavements, Factors affecting Pavement Performance and Design

[7] FLEXIBLE PAVEMENT DESIGN [07]
Design criteria, Design parameters, Design Methods-Empirical, Semi empirical and Theoretical methods, IRC recommendations

[8] RIGID PAVEMENT DESIGN [07]
Design criteria, Design parameters, Stresses in Rigid Pavements, Design of Joints, Rigid Pavement Design, IRC recommendations

[9] DISTRESSES IN PAVEMENTS AND ITS MAINTENANCE [05]
Introduction, Types of failures in flexible pavements and rigid pavements,

Pavement evaluation – Structural and Functional, Maintenance techniques

C LEARNING OUTCOMES

- After completion of this course, students will have adequate knowledge of design of pavements and perform experiments to analyse and interpret the data.

D RECOMMENDED TEXTBOOKS

1) Highway Engineering by S K Khanna, CEG Justo & A Veeraragavan; Nem Chand & Bros. publication.

E REFERENCE BOOKS

1) Principles of Highway Engineering by L R Kadiyali; Khanna Publishers
2) Principles of Transportation Engineering by Partha Chakroborty & Animesh Das; PHI Learning publication
3) Principles of Pavement Design by E J Yoder & M W Witczak; John Willey & Sons Inc. publication
4) IS:1201-1978 to IS:1220-1978, Methods for Testing Tar and Bituminous Materials
5) IS:2386-1-1963 to IS:2386-8-1963, Methods of Test for Aggregates for Concrete
6) IRC:37-2012, Tentative Guidelines for the Design of Flexible Pavements
7) IRC:115-2014, Guidelines for Structural Evaluation and Strengthening of Flexible Road Pavements Using Falling Weight Deflectometer (FWD) Technique
8) IRC:73-1990, Geometric Design Standards for Rural (Non-Urban) Highways
9) IRC:15-2017, Standard Specifications and Code of Practice for Construction of Concrete Roads

F LIST OF EXPERIMENTS TO BE PERFORMED UNDER THIS SUBJECT HEAD (IF APPLICABLE)

1) Aggregate Impact Test
2) Aggregate Crushing Test
3) Shape Test
4) Los Angeles Abrasion Test
5) Specific Gravity & Water Absorption Test of Aggregate
6) Soil CBR Test
7) Bitumen Penetration Test
8) Bitumen Softening point Test
9) Bitumen Ductility Test
10) Bitumen Viscosity Test
11) Bitumen Flash & Fire point Test

Elective 1 (CL715) EARTHQUAKE ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	2	0	60	40	25	0	125	3	2	0	5

A OBJECTIVES OF THE COURSE

- To make students familiar with the basics of Structural Dynamics, Seismic Analysis and Earthquake Resistant design of structures

B DETAILED SYLLABUS [Hr]

[1] INTRODUCTION TO EARTHQUAKE [02]

Geology of earth, influence of geology on earthquake, causes of earthquake and their characteristics. Earthquake parameters, magnitude, intensity, scales.

[2] THEORIES OF VIBRATION FOR SINGLE DEGREE OF FREEDOM (SDOF) SYSTEMS: [12]

Vibration, definition, causes, classifications, Introduction to single degree of freedom vibrations. Free and Forced Vibrations of SDOF System subjected to Harmonic Loading, Numerical Evaluation of Dynamic Response

[3] THEORIES OF VIBRATION FOR MULTI DEGREE OF FREEDOM (MDOF) SYSTEMS: [04]

Classical Modal Analysis for MDOF Systems, Calculation of Base Shear and Lateral Force on MDOF Systems

[4] SEISMIC ANALYSIS OF STRUCTURES AS PER IS 1893 (Part-1): 2016 [12]

Introduction to codal provisions, Calculation of Seismic Coefficient, Equivalent Static and Dynamic Analysis of Structures, Effect of Unreinforced Masonry Infill on analysis of Reinforced Concrete Frames, Effect of unsymmetrical geometry and masses, estimation of story shears and torsional moments for unsymmetrical buildings, Calculation of Liquefaction Potential

[5] CAPACITY DESIGN AS PER IS 13920: 2016 [06]

Concept of ductile detailing. IS:13920 code provisions for different RCC elements viz. Beams, Columns and Shear Walls.

C LEARNING OUTCOMES

- At the end of this course, students will have fundamental knowledge of dynamic analysis and earthquake resistant design.

D RECOMMENDED TEXTBOOKS

1) Dynamics of Structures – Theory and Application by Anil K Chopra, Pearson Publishers
2) Earthquake Resistant Design of Structures by Manish Shrikhande and Pankaj Agrawal, Prentice-Hall India Pvt. Ltd

E REFERENCE BOOKS

1) Structural Vibrations – Theory and Computation by Mario Paz, CBS Publishers
2) Structural Dynamics by Clough and Penzin, McGraw Hill Int.
3) The Seismic Design Handbook by Farzad Naeim, Springer Publishers
4) IS 1893 (Part 1): 2016, Criteria for Earthquake Resistant Design of Structures (Part 1: General Provisions and Buildings)
5) IS 13920: 2016, Ductile Design and Detailing of Reinforced Concrete Structures subjected to Seismic Forces – Code of Practice
6) IS 456:2000 (Reaffirmed 2005), Plain and Reinforced Concrete - Code of Practice (Fourth Revision)
7) SP16, Design Aids for Reinforced Concrete Structures.

Elective 2 (CL716) PROJECT PLANNING AND CONTROL

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	2	0	60	40	25	0	125	3	2	0	5

A OBJECTIVES OF THE COURSE

- To make students familiar with the basics of Project Planning and Execution

B DETAILED SYLLABUS [Hr]

[1] INTRODUCTION [04]

Construction industry and macroeconomics

[2] PROJECT FEASIBILITY AND VIABILITY [12]

Project feasibility studies, Life cycle concepts, cost engineering principles, project costs (Material, labor, equipment, fixed, variable, direct, indirect, recurring, non- recurring, etc.,) Economic considerations (interest rate tax, escalation, inflations), Implications of contractual obligations on costs, Economic and financial feasibility analysis, Analysis of risk and uncertainty.

[3] PROJECT FINANCING [10]

Project cash flow, Financing models and trends, Modeling capital projects for Successful funding. PPP financial models.

[4] PROJECT SCHEDULING AND CONTROL [10]

Project scope, project team, subcontract planning and control, Scheduling techniques, application software for project scheduling, Technical performance and monitoring, Accounting, Cost control, learning curve, and variances, PMIS

C LEARNING OUTCOMES

- At the end of this course, the students will have the knowledge about the planning, financing and scheduling of construction project

D RECOMMENDED TEXTBOOKS

1) Project Planning, Analysis, Implementation and review by Prasanna Chandra, Tata McGraw-Hill publication

E REFERENCE BOOKS

1) Construction Project Management by Clough and Sears, John Wiley and Sons

2) Construction Project Management by Ritz and George, McGraw-Hill publication.
3) Construction Project Management by K K Chitkara, McGraw-Hill publication.

Elective 3 (CL717) ADVANCED CONCRETE TECHNOLOGY

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	2	0	60	40	25	-	125	3	2	0	5

A OBJECTIVES OF THE COURSE

- To make the students aware of the various techniques and practices on basic construction materials like Cement, Concrete etc., Overall understanding on Microstructure, behaviour and properties of concrete. and careful selection of suitable construction materials and their mix proportions to satisfy performance criteria of structure.
- To get on hand practical experience of various Quality control techniques for Concrete.

B DETAILED SYLLABUS [Hr]

[1] CEMENT **[04]**
Hydration, chemistry and microstructure of cement paste, special cement

[2] MICROSTRUCTURES OF CONCRETE **[06]**
Interfacial transition zone, Structure-property relationships

[3] CHEMICAL AND MINERAL ADMIXTURES IN CONCRETE **[04]**
Types, Mechanism, Application

[4] PROPERTIES OF HARDENED CONCRETE **[06]**
Strength, Stress- strain behaviour, Dimensional stability, Fracture Mechanics and concrete failure mechanism

[5] MIX DESIGN **[06]**
Concrete Mix Design (IS, ACI, BS)

[6] CONCRETE DURABILITY **[02]**
Physical deterioration(abrasion, erosion, cracking) Chemical attack (sulfates/seawater/acid), Corrosion, Durability improvement measures

[7] TESTING AND QUALITY ASSURANCE OF CONCRETE **[04]**
Testing of fresh concrete, Destructive and non-destructive evaluation of hardened concrete, statistical quality control

[8] SPECIAL CONCRETE **[06]**
Cement and polymer concrete compositions, Self-compacting concrete, Ready mixed concrete, High performance concrete

C LEARNING OUTCOMES

- Overall understanding on Microstructure, behaviour and properties of concrete.
- In addition to traditional methods, students will get to know about Modern Concretes, Various admixtures and Quality control techniques through on hand practical experience.
- Do most optimum methods for Concrete mix designs.

D RECOMMENDED TEXTBOOKS

1) Concrete technology by A.N.Neville & J.J.brooks ELBS publication,1987.

E REFERENCE BOOKS

1) Microstructure, Properties and Materials" by Mehta, P.K, Monterio P.J.M.",Concrete - Third edition, McGraw hill Publishers, New Delhi,1993
2) Fracture Mechanics of Concrete: Applications of Fracture Mechanics to Concrete and other qusai brittle materials. By Shah S.P.,Swaets,S.E., and Ouyang, Wiley, New York 1995
3) Concrete technology by A.N.Neville ELBS publication,1987
4) I.S. Concrete Mix Proportioning- Guidelines.(IS10262:2009)
5) IS:456-2000, "Plain and Reinforced concrete code of practice, BIS, New Delhi
6) IS:383-1970. "Specification for coarse and fine aggregates from natural source of concrete, BIS, New Delhi.

Approximate 25 examples based on the topics including mix design and an internal seminar by each student for special concrete applications.

Elective 4 (CL718) DESIGN OF SPECIAL STRUCTURES

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	2	0	60	40	25	0	125	3	2	0	5

A OBJECTIVES OF THE COURSE

- To make students understand design practices for Reinforced Concrete and Steel structures and solve design problems

B DETAILED SYLLABUS [Hr]

[1] Complete design and structural detailing for industrial, public utility and recreational purposes structures; Storage vessels, underground structures in:

(i) Concrete **[20]**

(ii) Steel **[20]**

C LEARNING OUTCOMES

- At the end of this course, students will be able to handle RCC and Steel design problems.

D RECOMMENDED TEXTBOOKS

1) Dynamics of Structures – Theory and Application by Anil K Chopra, Pearson Publishers
2) Earthquake Resistant Design of Structures by Manish Shrikhande and Pankaj Agrawal, Prentice-Hall India Pvt. Ltd.

E REFERENCE BOOKS

1) Design of RCC Structures Vol-II by H. J. Shah, Charotar Publication
2) Reinforced Concrete Design by S. N. Sinha, McGraw Hill Education; Third edition.
3) Design of RCC Structures by P. C. Varghese, PHI Publications
4) Limit State Design of Steel Structures, S. K. Duggal, Mc Graw Hill Publications.
5) Design of Steel Structures, Arya & Ajmani, Nemchand & Sons Publications.
6) Design of Steel Structures, S. Ramamrutham, Dhanpatrai Publishing Company.
7) IS 456:2000 (Reaffirmed 2005), Plain and Reinforced Concrete - Code of Practice (Fourth Revision)
8) IS 800:2007, General Construction in Steel – Code of Practice (Third Revision)
9) IS 1893 (Part 1): 2016, Criteria for Earthquake Resistant Design of Structures (Part 1: General Provisions and Buildings)

10) IS 13920: 2016, Ductile Design and Detailing of Reinforced Concrete Structures subjected to Seismic Forces – Code of Practice
11) IS 875 (Part 1): 1987, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures (Dead Loads)
12) IS 875 (Part 2): 1987, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures (Imposed Loads)
13) IS 875 (Part 1): 2015, Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures (Wind Loads)
14) SP24, Explanatory Handbook on Indian Standard Code of Practice for Plain and Reinforced Concrete Structures.
15) SP16, Design Aids for Reinforced Concrete Structures.
16) SP34, Handbook on Concrete Reinforcement and Detailing