BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
B.Tech. (Civil) (Sem - I) -2014 Course

Sr. No.	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
						Continuous Assessment						
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assingnments	TW	Total	Theory	TW
1.	Engineering Mathematics- I	3	--	1	60	20	10	10	--	100	4	-
2.	Fundamentals of Civil Engineering	3	2	--	60	20	10	10	25	125	3	1
3.	Engineering Graphics*	4	2	--	60	20	10	10	25	125	4	1
4.	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1
5.	Fundamentals of Electrical Engineering	3	2	--	60	20	10	10	25	125	3	1
6.	Professional Skill Development-I	2	--	--	30	--	--	20	--	50	2	-
7.	Computer Applications in Civil Engineering-I	-	2	--	--	---	--	--	50	50	-	1
	Total	**19**	**10**	**1**	**330**	**100**	**50**	**70**	**150**	**700**	**20**	**5**

*End Semester Exam of increased duration by 1 hour.

Choice Based Credit System Structure for Undergraduate Course

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
B. Tech. (Civil) (Sem - II) - 2014 Course

Sr.No.	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
8.	Engineering Mathematics- II	3	--	1	60	20	10	10	--	100	4	-
9.	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1
10.	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1
11.	Engineering Chemistry	4	2	--	60	20	10	10	25	125	4	1
12.	Building Construction	3	2	--	60	20	10	10	25	125	3	1
13.	Professional Skill Development-II	2	--	--	30	--	--	20	--	50	2	-
14.	Workshop Technology	--	2	--	--	---	--	--	50	50	-	1
	Total	**19**	**10**	**1**	**330**	**100**	**50**	**70**	**150**	**700**	**20**	**5**

Total Marks of Sem-I and Sem-II = 1400

Total Credits of Sem-I and Sem-II = 50

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
ENGINEERING MATHEMATICS-I

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 3Hrs/Week	Semester Examination: 60 marks	Theory : 03
Tutorials: 1Hr/Week	Continuous Assessment:40 marks	Tutorial : 01

Unit I

MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence,Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem.Application to problems in Engineering .

(08 Hours)

Unit II

COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

(08 Hours)

Unit III

DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions,Leibnitz's Theorem.

EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

(08 Hours)

Unit IV

DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence. **(08 Hours)**

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

Unit V

PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables.Errors and Approximations.

(08 Hours)

Unit VI

JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

(08 Hours)

Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar, Pune VidyarthiGrihaPrakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8thedition(1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning,6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition(2002).

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III
Unit Test II :-Unit IV,V,VI

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

02: Fundamentals of Civil Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have

1.	Concepts of units and conversions of units.
2.	Basic knowledge of Chemistry
3.	Basic knowledge of geography, concept of latitude and longitude.

Course Objectives:

	To make student understand the scope and application of Civil Engineering

Course Outcomes:

Students will be able to understand

1.	Different building components and material
2.	Classification of surveying
3.	Levellingof the ground
4.	Planning of building
5.	Methods of irrigation and water supply
6.	Different methods of transportation

UNIT - I	**Civil Engineering Scope And Applications.**	**(06 Hours)**

	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
UNIT - II	**Surveying**	**(06 Hours)**
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
UNIT - III	**Building Planning And Bye Laws**	**(06 Hours)**
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.	
UNIT - IV	**Foundations and Earthquakes**	**(06 Hours)**
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
UNIT - V	**Irrigation And Water Supply**	**(06 Hours)**
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
UNIT - VI	**Infrastructure**	**(06 Hours)**

	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	

Term Work:	
(Term work shall consist of any eight exercises from the list given below.)	
1.	Study and use of prismatic compass and measurement of bearings.
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.
3.	Area measurement by Digital Planimeter.
4.	Drawing plan and elevation of a residential bungalow.
5.	Study of features of topographical maps.
6.	Assignment on collection of information on Civil Engineering materials.
7.	Assignment on types of foundations.
8.	Assignment problem on irrigation and hydropower structures.
9.	Assignment on study of flow chart of water and sewage treatment.
10.	Assignments on types of transportation systems.
Text Books:	
1.	" Surveying- Vol I " - S.K. Duggal , Tata McGraw Hill Publication.
2.	"Built Environment" – Shah , Kale, Patki, , Tata McGraw Hill Publication
3.	"Building Construction" – Dr. B.C. Punmia , Laxmi Publication
4.	"Irrigation and water Power Engineering "- Dr. P.N. Modi,Standard Publishers

	,New Delhi
5.	"Text book of Transportation Engineering "- Arora, Charotar Publishers.
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7.	"Basic Civil engineering"- M.S. Palanichamy- Tata McGraw Hill Publication
Reference Books:	
1.	"Surveying –Theory and Practice"-James Anderson- Tata McGraw Hill Publication

Syllabus for Unit Test:	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	05
Practical: 02 Hours / Week	Continuous Assessment: - 40Marks	
	Term Work: 25 Marks	

Unit I	**Lines and Dimensioning in Engineering Drawing** Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. **Curves used in Engineering Practice** Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.	(6)
Unit II	**Orthographic Projection** Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.	(6)
Unit III	**Isometric Projections** Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.	(6)
Unit IV	**Projections of Points and Lines and planes** Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP	(6)
Unit V	**Projection of Solids**	(6)

	Projection of prism, pyramid, cone and cylinder by rotation method.	
Unit VI	**Section of Solids** Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.	(6)

Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1nd and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

Text Books

1. “Elementary Engineering Drawing”, N.D. Bhatt, Charotar Publishing house, Anand India,

2. “Text Book on Engineering Drawing”, K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.

3.“Fundamentals of Engineering Drawing”, Warren J. Luzzader, Prentice Hall of India,

New Delhi ,

4. “Engineering Drawing and Graphics”, Venugopal K., New Age International

Publishers.

5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005

6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria

and Sons, 2005

7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
ENGINEERING PHYSICS

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks Term Work: 25marks	Practical: 01

UNIT – I

MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

(08hours)

UNIT – II

SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

(08hours)

UNIT – III

THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of j by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second

law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

NANOSCIENCE

Introductions of nanoparticals, properties of nanoparticals (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticals(Physicaland chemical), synthesis of clloids, growth of nanoparticals, synthesis of nanoparticals by colloidal rout, applications.

(08hours)

UNIT-IV

OPTICS - I

INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC.

DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

(08 hours)

UNIT-V

OPTICS - II

POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

(08 Hours)

UNIT-VI

ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption

coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

TERM WORK

Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

02: Fundamentals of Electrical Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have

1.	Mathematics
2.	Physics

Course Objectives:

	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all fist year engineering students.

Course Outcomes:

1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer
5.	Define basic terms of single phase and three phase ac circuits and supply systems
6.	Know and use electrical safety rules

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

UNIT - I	**Basic concepts .**	**(06 Hours)**
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
UNIT - II	**Network Theorems**	**(06 Hours)**
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
UNIT - III	**Electrostatics**	**(06 Hours)**
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction& working.	
UNIT - IV	**Magnetic Circuit & Transformer**	**(06 Hours)**
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
UNIT - V	**AC Fundamentals & AC Circuits**	**(06 Hours)**

	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
UNIT - VI	**Electrical Wiring and Illumination system**	**(06 Hours)**
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

Term Work:

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
   a)Voltage and current ratios.
   b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books:

1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi

2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi

3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd

Reference Books:

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication	
2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications	
3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications	
4. Vincent Del Toro – "Principles of Electrical Engineering", PHI Publications	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

07: Computer Applications in Civil Engineering-I

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination: ---	-------
Practical: 02 Hours / Week	Continuous Assessment:	
	Term Work: 50 Marks	01 Credit

Course Pre-requisites:

The students should have

1.	Basic knowledge of computer components, systems and operating of computer
2.	Basic mathematical ability

Course Objectives:

	To develop an ability to use MS- Excel and MS- Power Point

Course Outcomes:

1.	To solve different problems using M S- Excel
2.	To generate various graphs and charts by analyzing the given data in Excel
3.	To present different problems in various slides using M S – Power Point

Use of computers in Civil Engineering is increasing day by day. Various analysis and design problems can be solved by preparing the programs in Microsoft Office Excel. Also to present any problem properly, knowledge Microsoft PowerPoint is required. Use of Microsoft Office Excel and PowerPoint will make the candidate to analyze and present different problems, the details of which are as listed below:

Learning Microsoft Excel:

- Introduction
- Getting Started
- Data analysis and Calculations using relevant formulae.
- Generate graphs and charts.

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

Learning Microsoft PowerPoint:

- Introduction
- Getting Started
- Preparation of various slides
- Preparing presentation by giving different effects to the data entered.

Term Work:

Term work shall consist of **8 assignments**as follows:

1) Introduction to Microsoft Excel
2) Preparation of Excel Sheets with various solvedequations.
3) Graphical representation of different data.
4) A mini project with Microsoft Excel
5) Introduction to Microsoft PowerPoint.
6) Preparation of slides.
7) Insertion of clipart, word-art, histograms, different shapes and various charts.
8) A mini project with Microsoft PowerPoint.

Reference Books:

1)"Excel 2013 Bible" by John Walkenbach

2)"Excel 2010 All-in-one For Dummies" by Greg Harvey

3)"Microsoft PowerPoint 2013 Introduction Quick Reference Guide" by Beezix Inc.

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
ENGINEERING MATHEMATICS-II

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 3Hrs/Week	End Semester Examination: 60 marks	Theory : 03
Tutorials: 1Hr/Week	Continuous Assessment:40 marks	Tutorial : 01

Unit I

DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE.Solutions ofVariable Separable DE, Exact DE, Linear DE and reducible to these types.

(08 Hours)

Unit II

APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat, Chemical engineering problems.

(08 Hours)

Unit III

FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series,Harmonic Analysis.

INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

(08 Hours)

Unit IV

INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

CURVE TRACING

Tracing of Curves, Cartesian, Pola and Parametric Curves.Rectification of Curves.

(08 Hours)

Unit V

SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

(08 Hours)

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
Unit VI

MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area,Volume, Mean and Root Mean Square Values.

(08 Hours)

Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition(1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar, Pune VidyarthiGrihaPrakashan, Pune, 7th edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning,6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition(2002).

Syllabus for Unit Test:

Unit Test I :- Unit I,II,III
Unit Test II :- Unit IV,V,VI

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
FUNDAMENTALS OF MECHANICAL ENGINEERING

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: -60Marks	04
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	**Thermodynamics-** Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)	(08)
UNIT-II	**Introduction to I.C. Engines and turbines-** Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams) **Introduction to refrigeration, compressors & pumps-** Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)	(08)

UNIT-III	**Energy Sources** - Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power. **Heat transfer**- Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.	(08)

UNIT-IV	**Properties of fluids-** Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow. **Properties of Materials and their Applications-** Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.	(08)
UNIT-V	**Mechanical devices** - Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.	(08)

	Mechanisms- Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism	
UNIT-VI	**Machine Tools-** Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine. **Introduction to manufacturing processes and Their Applications-** Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.	(08)

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

References-

1 “Thermodynamics An Engineering Approach” Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.

2. “Applied Thermodynamics for Engineering Technologists” T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.

3. “I.C. Engines Fundamentals” J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian

4. “Internal Combustion Engine “: V. Ganeshan, Tata McGraw-Hill, 3rd edition.

5 “Strength of Materials” H. Ryder, Macmillians, London, 1969, 3rd edition.

6. “Mechanics of Materials” Johston and Beer TMH, 5th edition

7 “Mechanisms and Machine Theory” Ambekar A.G., Prentice-Hall of India**,** 2007.

8. “Theory of Machines” S.S. Rattan, Tata McGraw- Hill, 2nd edition.

9 “A Textbook of production engineering” P.C. Sharma, S. Chand Publication,

New Delhi, 2nd edition.

10 “Fluid Mechanics & Fluid Power” D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

10: Engineering Mechanics

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have knowledge of

1.	Scalar and Vector
2.	Newton's law of motion
3.	Law of friction
4.	Concept of physical quantities, their units and conversion of units
5.	Concept of differentiation and integration

Course Objectives:

	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes:

The student should be able to

1.	calculate resultant and apply conditions of equilibrium.
2.	analyze the truss and calculate friction force.
3.	calculate centroid and moment of inertia.
4.	solve problem on rectilinear motion.
5.	solve problems on curvilinear motion.
6.	useD'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

UNIT - I	**Resultant and Equilibrium**	**(06 Hours)**
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane,Force and Couple system about a point.	
UNIT - II	**Truss and Friction**	**(06 Hours)**
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	**Centroid and Moment of Inertia**	**(06 Hours)**
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
UNIT - IV	**Kinematics of Rectilinear motionof a Particle**	**(06 Hours)**
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
UNIT - V	**Kinematics of Curvilinear motionof a Particle**	**(06 Hours)**
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
UNIT - VI	**Kinetics of a Particle**	**(06 Hours)**
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum	

	Principle, Coefficient of Restitution, Direct Central Impact.	

Term Work:

A) The term-work shall consist of minimum **Five** experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

B) The term-work shall also consist of minimum **Five** graphical solutions of the problems on different topics.

Text Books:

1) "Engineering Mechanics (Statics and Dynamics)",Hibbeler R.C., McMillan Publication.

2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)",Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.

3) "Engineering Mechanics",Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.

Reference Books:

1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.
3. "Engineering Mechanics (Statics and Dynamics)",Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.
4. "Engineering Mechanics (Statics and Dynamics)",Timoshenko S.P. and Young D.H., McGraw Hill Publication.
5. "Engineering Mechanics (Statics and Dynamics)",Tayal A.K., Umesh Publication.
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
ENGINEERING CHEMISTRY

Teaching Scheme:	Examination scheme:	Credits Allotted:
Lectures: 4Hrs/Week	End Semester Examination: 60 marks	Theory: 04
Practical: 2Hr/Week	Continuous Assessment: 40 marks	Practical: 01
		Term Work: 25marks

Unit I

WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning
Numerical based on the zeolite process **(08 Hours)**

Unit II

MATERIAL CHEMISTRY

Crystallography : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.
Cement : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications. **(08 Hours)**

Unit III

FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV. **(08 Hours)**

Unit IV

CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.
Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping. **(08 Hours)**

Unit V

ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles. **(08 Hours)**

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

Unit VI

STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

TERM WORK

Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6th edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

Syllabus for Unit Test:

Unit Test I :- **Unit I,II,III**
Unit Test II :- **Unit IV,V,VI**

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

12: Building Construction

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

Course Pre-requisites:

The Students should have basic knowledge of

1.	Fundamentals of civil Engineering
2.	Concept of Engineering Graphics

Course Objectives:

	To develop the knowledge of building components, materials and construction practices

Course Outcomes:

The student should able to

1.	understand different types of foundation and masonry.
2.	design staircase .
3.	understand types of Arches and flooring.
4.	understand different methods of building finishes.
5.	know different types of formworks.
6.	understand different properties of construction materials.

UNIT - I	**Building Foundations And Masonry**	**(06 Hours)**
	Building foundations: Necessity,Types, Building and its components,	

	Masonry : Stone, Brick ,Types of bonds in brick masonry, Composite masonry, Hollow and Solid block masonry, Mortars used in construction.	
UNIT - II	**Doors , Windows And Stairs**	**(06 Hours)**
	Doors: Classification, Terminology used, Frames, Sizes . Windows :Types , Sizes. Stairs : Classification , Terminology used ,Design of stairs. Lifts,, Escalators, Ramps.	
UNIT - III	**Arches, Lintels And Floors**	**(06 Hours)**
	Arches: Classification, Terminology used,, Stability Lintels :Types, Details of R.C.C. lintels and chhajja. Flooring: I.S. Specifications, Types , Factors for selection of flooring.	
UNIT - IV	**Roof Construction**	**(06 Hours)**
	Roofs :Types, Suitability, Roof structures, Selection of roof covering material, Methods of water proofing of roofs, Types of trusses, Fixtures & fastenings	
UNIT - V	**Building Finishes**	**(06 Hours)**
	Plastering : Methods, tools used, Mortars, Defects ,Plaster of Paris. Pointing: Types, Methods of pointing Paints : Types , Textures, Apex, Plastic emulsion , Wall cladding and its Materials	
UNIT - VI	**Formwork , Scaffolding And Smart Materials**	**(06 Hours)**
	Formwork : Necessity , Materials , Factors for selection , Types. Scaffolding : Necessity , Materials ,Factors for selection . Precast concrete , Ferrocrete , Nanoconcrete , Green construction materials, Tremix	

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE

Term Work:
Plates-(1/4 imperial size)
a. Symbols of Material & structures
b. Section of wall
c. Brick bonds - English bond, Flemish bond
d. Types of stone masonry
e. Arches - any three
f. Types of steel trusses - any three
g. Paneled Door & Flush doors.
h. M.S. Window, Aluminum Window, Louvers Windows
Collection of information brochures related to Construction Material.
Assignment : One from each Unit.
Text Books:
1) "Building Construction"-Rangwala,Charotar Publication
2) "The Text Book of Building Construction"-S.P.Arora& S.P.Bindra-DhanpatRai Publication
3) " Building Technology and Valuation"- TTTI Madras,-- Tata McGraw Hill Publication
Reference Books:
1) " My Construction Practices "R.B.Chaphalkar
2)"A to Z" Building Construction" Mantri Publications
3) "Materials of Construction" – Ghose- Tata McGraw Hill Publications
4) " Civil engineering Material'- TTTI Chandigarh- Tata McGraw Hill Publications

Syllabus for Unit Test:	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VII

BHARATI VIDYAPEETH
DEEMED UNIVERSITY, PUNE
Workshop Technology

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: -	End Semester Examination: -	01 Credit
Practical: 02 Hours / Week	Continuous Assessment: -	
	Term Work: 50 Marks	

Course Pre-requisites: Basic knowledge of hand tools used in day to day life.

Course Objectives: Make the students familiar with basic manufacturing processes

Course Outcomes: students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Carpentry- Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances

Term work includes one job involving joint and woodturning.

Fitting- Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining- Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.

Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme: B. Tech. (Civil) – Sem III - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
1.	Building Planning, Design and Byelaws*	3	2	--	60	20	10	10	50	--	150	3	1	4
2.	Applied Geology	3	2	--	60	20	10	10	--	50	150	3	1	4
3.	Engineering Economics & Financial Accounting	3	-	-	60	20	10	10	--	---	100	3	--	3
4.	Mechanics of Solids	4	--	1	60	20	10	10	---	---	100	5	-	5
5.	Concrete Technology	3	--	--	60	20	10	10	--	----	100	3	-	3
6.	Professional Skill Development-III	4	--	--	100	---	----	--	--	----	100	4	-	4
7.	Computer Applications in Civil Engineering-II	---	2	--	---	--	---	---	---	50	50	---	1	1
8.	Testing of Materials	--	2	--	--	--	--	--	50	---	50	--	1	1
	Total	**20**	**08**	**01**	**400**	**100**	**50**	**50**	**100**	**100**	**800**	**21**	**4**	**25**

*End Semester Exam of duration 4 hours.

\

Programme: B. Tech. (Civil) – Sem IV - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
9.	Engineering Mathematics-III	3	--	1	60	20	10	10	--	---	100	4	-	4
10.	Surveying	3	4	--	60	20	10	10	--	50	150	3	2	5
11.	Mechanics of Fluids	3	2	--	60	20	10	10	50	----	150	3	1	4
12.	Construction Techniques and Machinery	3	--	--	60	20	10	10	---	----	100	3	-	3
13.	Structural Analysis- I	3	--	--	60	20	10	10	---		100	3	-	3
14.	Professional Skill Development-IV	4	--	--	100	--	--	--	--	---	100	4	--	4
15.	Computer Applications in Civil Engineering-III	---	2	--	---	--	---	---	---	50	50	---	1	1
16.	Civil Engineering Construction Practice	--	2	--	--	--	--	--	50	----	50	--	1	1
	Total	**19**	**10**	**01**	**400**	**100**	**50**	**70**	**100**	**100**	**800**	**20**	**5**	**25**

Total Credits

Semester III = 25

semester IV = 25

Grand Total = 50

01: BUILDING PLANNING , DESIGN AND BYELAWS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTED:
Theory : 3 Hours/ Week	End Semester Exam: 60Marks	03 Credits
Practical : 1 Hour/ Week	Continuous Assessment : 40Marks	
	Term Work & Oral Exam: 50 Marks	01 Credit

Course Pre-requsites:

The Student Should have

1	Fundamentals of Civil Engineering
2	Building Construction Practices

Course Objective:

	To make the student understand the process of building planning and building byelaws

Course Outcomes:

Student will be able to

1	describe various types of buildings, their planning and building byelaws.
2	apply design considerations for climate, ventilation and lighting in building planning.
3	apply design considerations for Noise & acoustics, fire protection, Electrical & telecommunication and circulation in building planning.
4	apply design considerations for plumbing services in building planning.
5	explain the legal aspects of plan sanctioning.
6	explain the role of town planning authority and various presentation drawings.

Unit -I	Buildings, Types, Planning and Regulations :	(06 Hours)
	Types of Residential Building units – Bungalows, Twin bungalows, Row houses, Apartments; Requirements of Public buildings - Educational buildings, buildings for health care, industrial buildings and commercial buildings; Principles of planning for building, Integrated approach necessity. Building Rules Regulations and Byelaws necessity, plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation; Types of drawings - Submission drawings, working drawings and Architectural drawing.	

Unit II	**Building Services I**	**(06 Hours)**
	(a) Climate - elements of climate, global climate, thermal design Principles, comfort sectors, Heat exchange of building. Thermal insulation of roof and wall. (b) Ventilation and lighting - comfort factors, function of ventilation, stack effect wind effect. Mechanical ventilation, ventilation rate, Air conditioning-design data, cooling load, Air conditioning systems. (c) Noise and acoustics –Effect of noise, comfort standards, Noise control sound insulation, Acoustics reverberation Sabines formula acoustical defects conditions of good acoustics.	
Unit III	**Building Services II**	**(06 Hours)**
	(a) Plumbing services, fixtures and fastenings, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems, (b)Fire Protection – Fire safety, fire load, grading of occupancies by fire load, fire escape elements. (c)Constructional requirements for different building services like Electrical, Telecommunication services, Circulation-Lift escalators, Entertainment services.	
Unit IV	**New Planning Concepts of Buildings**	**(06 Hours)**
	Layout plans of different types of buildings, Design and planning of ECO Friendly building, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings.	
Unit V	**Legal Aspects of Plan Sanctioning**	**(06 Hours)**
	Role of Plan Sanctioning Authority for layout, co-op Housing societies and apartments. Ownership of land, plot, 7/12 abstract, meanings of different terms of 7/12 abstract, 6-D form, list of documents to be submitted along with building Plan for sanction from the authority. TDR, certificate of commencement and completion, various no objection certificates to be produced, format of permissions from pollution control board, MSEB, Water Supply and Drainage Department, State or National Highway Department.	
Unit VI	**Town Planning and Presentation drawings**	**(06 Hours)**
	(a) Necessity of town planning in India. Importance of safety, amenities and services, Development plan, Land use- zoning: Introduction to different zones of land in town planning, Requirements of residential zone, commercial industrial and agricultural zone, open areas, green belts and parks. (b) Axonometric, Perceptive-One point and Two point.	
Term work : It shall consist of :		

1.	Preparation of working drawings of any one of the buildings listed below: a) Residential Building b) Commercial Building c) Educational Building d) Industrial Building e) Recreational Building f) Health Club
2.	Sheets to be drawn a) Plan/Typical floor plan to a suitable scale. b) Elevation and section to a suitable scale. c) Site plan showing water supply and Drainage d) Foundation Plan to a suitable scale.
3.	Line plan of remaining five buildings.
4.	Perspective Drawing of different objects.

Assignments:	
1	Study of building bye laws and D.C. rules of local authority
2	Study of different types of drawings.
3	Data collection with respect to climate , ventilation and lighting in building planning.
4	Study of various components of water supply and drainage system of buildings.
5	Case studies with respect to fire fighting of high rise building.
6	Case studies with respect to lift and escalators.
7	Study of constructional requirements with respect to electrical services in buildings.
8	Case studies of Ecofriendly and intelligent buildings.
9	Collecting information about legal aspects of building planning.
10	Writing report on development plan.
Text Books :	
1.	Bindra Arora, “Building Construction”, Laxmi Publication
2.	M. L. Shah, C. M. Kale, S. Y. Patki, “Building Drawing with integrated approach to Built Environment”, Tata McGraw Hill Publishers
3.	Rangwala, “Town Planning” , Charaotar Publications
References :	
3.	IS provisions “National Building Code”
4.	“Development Control Rules” of local plan sanctioning authority
5.	Calendar, “Time Saver Standards for Architectural Design”, Tata McGraw Hill Publishers
6.	Merit, “Building Design and Construction”, Tata McGraw Hill Publishers

Syllabus for Unit Test:	
Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

02: APPLIED GEOLOGY

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Unit Test: 20Marks	
	Assignment : 10 Marks	
	Attendance: 10 Marks	
	TW & Practical : 50 Marks	01 Credits

Course Pre-requisites:

The Students should have

1. Basic knowledge of engineering science

Course Objectives:

To make students understand physical geology, mineralogy, petrology, structural & Indian geology, surface & sub surface water, geological investigation for tunnel, dam, reservoir & bridge

Course Outcomes:

1. Students should be able to identify different rocks & minerals.
2. Students should be able to explain Geology of River, Mountain earthquakes & volcanism to decide the location ,type of foundation and type of civil engineering structure
3. Students should be able to identify different Geological structures to decide location and type of civil engineering structure.
4. Students should be able to determine influence of texture & structures of rocks on occurance of Ground water.
5. Students should be able to prepare Geological maps and Geological sections for subsurface investigations.
6. Student should be able to explain different methods of core drilling and core preservation

UNIT - I	**Physical Geology & Introduction to Engineering Geology:**	**(06 Hours)**
	Origin of Earth, Surface Relief of the earth, Earth Movement, Earthquake, Interior of the Earth, Volcanocity: Product of Volcanoes, types of mountains, Different Branches of Geology, Engineering Geology as a Subject.	
UNIT - II	**Mineralogy and Petrology:**	**(06 Hours)**
	Mineralogy: Formation Process of Minerals, Types of Minerals, Classification of Minerals. Petrology- Rocks & minerals, Igneous rocks- mineral composition, texture, classification of igneous rock, study of common rock types, secondary rocks- weathering, texture & structure of sedimentary rocks & its classification, metamorphic rocks, agents & types of metamorphism,	

	metamorphic textures Building stones.	
UNIT - III	**Structural Geology & Indian Geology:**	**(06 Hours)**
	Structural Geology- Outcrop, dip & strike, conformable series, unconformity & overlap, faults & folds in rocks, mode of occurrence of igneous rocks, joints & fractures. Indian Geology- General Principles of stratigraphy, age of the earth & divisions of geological time, physiographic divisions of India & their characteristics, geological history of peninsula, study of formation in peninsula.	
UNIT - IV	**Water: Surface & Sub Surface**	**(06 Hours)**
	Surface Water: Geological action of running water, river valley development, normal & regional cycle of river erosion, waterfalls, ox-bow lakes, flood plane deposits, deltas, rejuvenation & resulting features,. Sub - Surface Water: Types of Groundwater, depth zones of groundwater, perched water table, pervious & impervious rocks, geological work done by groundwater, natural springs & seepages, effect of pumping, cone of depression, circle of influence, conservation of groundwater, artesian wells, water bearing capacity of common rocks.	
UNIT - V	**Geological Investigations**	**(06 Hours)**
	Preliminary geological investigations- use of geological maps & sections, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts etc., limitation of drilling, engineering significance of geological structures, Tunneling- Influence of geological condition on design & construction method, preliminary geological investigations for tunnels, important geological considerations while choosing alignment, difficulties during tunneling, as related with lithology, nature & structure of materials to be excavated, role of groundwater, geological conditions likely to be troublesome, suitability of common rock types for tunneling, case studies.	
UNIT - VI	**Geological Aspects at Dams, Reservoirs & Bridges**	**(06 Hours)**
	Geology of dam site- preliminary geological work at dam site, influence of geological condition on the choice of types & design of dam, favorable & unsuitable geological conditions for locating a dam i.e. landslide, treatment of leaky rocks & geological structures, case studies. Geology of reservoir sites- Dependence of water tightness on physical properties & structures of rocks, geological conditions suitable & unsuitable	

	for reservoir sites, conditions likely to cause leakage through reservoir rim, importance of groundwater studies & effect of rising of water table, case studies. Geology of Bridge Sites- Preliminary geological exploration for bridge piers & bridge abutments, scouring & erosion around bridge piers, influence of nature & structure of rocks on bridge foundation, case studies.	

List of Practicals / Term work:

1) Identification of the Minerals (Two Practical)
2) Identification of Igneous rocks (Two Practical)
3) Identification of Secondary rocks (Two Practical)
4) Identification of Metamorphic rocks (Two Practical)
5) Study of Contoured Geological Maps & drawing the sections (Six Practical)
6) Visit to site of Dam / Tunnel for understanding the geological features.

Assignments

1) Collect and describe rock forming minerals & ore forming minerals
2) Collect and describe igneous rocks
3) Collect and describe secondary rocks
4) Collect and describe metamorphic rocks
5) Collect information and photographs of volcanoes
6) Collection of information about waterfalls & ox-bow lakes in India
7) Collection of data about different geological structures like folds, faults & unconformities
8) Conduct survey of ground water in India\
9) Conduct survey of geological conditions suitable for tunneling.
10) Conduct survey of geological conditions suitable for dam .

References.

1) Gupte R. B., “A Text Book of Engineering Geology”, P. V. G. Publications, Pune
2) Legget R., “Geology and Engineering”, McGraw Hill Book Co., London
3) Trefethen J. M., “Geology for Engineers”, D Van Nostrand Co. Inc.
4) Schultz J. R. and A. B. Cleaves, “Geology in Engineering”, John Wiley Inc.
5) Engineering Geology & General Geology by Parbin Singh.
6) General Geology & Engineering Geology by Dr. P. T. Sawant, New Delhi Publication.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

03.ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDITS ALLOTTED**
Theory: 03 Hours / Week	Continuous Assessment 40 Marks	03 Credits

Course Pre-requisites:

The Students should have knowledge of

1.	Civil Engineering
2.	Mathematics

Course Objectives:

	To make students understand engineering economics and financial management

Course Outcomes: The Student will be able to

1.	The Student will be able to draw organization chart.
2.	The Student will be able find out time value of money.
3.	The Student will be able select best project.
4	The Student will be able find out depreciation cost.
5	The Student will be able prepare balance sheet.
6	The Student will be able generate finance for his organization.

UNIT - I	**Elementary Economics**	**(06 Hours)**
	Definition of Economics, nature, scope and importance of Engineering economics, basic economics concept-Human wants. Utility, value, cost, price, profit, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labor, capital and organization.	
UNIT - II	**Engineering Economics**	**(06 Hours)**
	Basic principles, time value of money, cash flow diagram. Equivalence-single payment in the future, present payment compare to uniform series payment. Future payment compare to uniform series payment.	
UNIT - III	**Project Economics Analysis**	**(06 Hours)**
	. Comparison of alternatives, net present value present, future and annual worth method of comparing alternatives, internal rate of return. Break even analysis. Benefit cost ratio	

UNIT - IV	**Depreciation and Value Engineering**	**(06 Hours)**
	Depreciation and methods of depreciations. Inflation, value engineering and value analysis.	
UNIT - V	**Financial Management**	**(06 Hours)**
	Financial management, construction accountancy charts of accounts, financial statement, profit and loss account, balance sheet, insurance audits and financial risk aspects	
UNIT - VI	**Project Budgeting**	**(06 Hours)**
	. Types of capitals, fix and working capital, debentures, shares, public deposits. Forms of foreign capital, money and capital market in India. New economical policy. Role of financial institutions in economical development, RBI government of India guidelines for foreign funding in construction projects.	

Assignments

1) Preparation of organization chart for small construction project
2) Preparation of organization chart for large construction project
3) Preparation of cash flow diagrams and finding out time value of money
4) Comparison of different projects by different methods
5) Benefit cost analysis of project
6) Determination depreciation value of equipments
7) Preparation of balance sheet for project
8) Assignment on value analysis
9) Collection of data regarding RBI government of India guide lines for foreign funding in construction project.
10) Numericals on engineering economics

References Books

1 Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.
2 Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.
3 Boyer, C. B. and Merzbach, U. C., "A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989.
4 Gould, F. E., "Managing the Construction Process", 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.
5 Gransberg, D. G., Popescu, C. M. and Ryan, R. C., "Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.
6 Harris, F. , McCaffer, R. and Edum-Fotwe, F., "Modern Construction Management", 6th ed., Blackwell Publishing, 2006.
7 Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2011.
8 Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., "Engineering Economic Analysis", Indian Edition, Oxford University Press, 2010.

9 Ostwald, P. F., “Construction Cost Analysis and Estimating”, Prentice Hall, Upper Saddle River, New Jersey, 2001.
10 Peterson, S. J., “Construction Accounting and Financial Management”, Pearson Education, Upper Saddle River, New Jersey, 2005.
11 Peurifoy, R. L., Schexnayder, C. J. and Shapira, A., “Construction Planning, Equipment, and Methods, 7th ed., Tata McGraw-Hill, New Delhi, 2010.
12 Peurifoy, R. L. and Oberlender, G. D., “Estimating Construction Costs”, 5th ed., McGraw-Hill, New Delhi, 2004.
13 Schexnayder, C. J. and Mayo, R. E., “Construction Management Fundamentals”, International Edition, McGraw-Hill, 2003.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

04 : MECHANICS OF SOLIDS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites: The students should have knowledge of-	
1.	Engineering Mechanics
Course Objectives:	
	The student should be able to calculate stresses developed in the material.
Course Outcomes: The student will be able to	
1.	calculate stresses due to axial force.
2.	calculate shear force and bending moment in the beam.
3.	calculate bending stress and deflection in the beam.
4	calculate shear stress due to shear force and torsion.
5	calculate critical load for column.
6	calculate principal stresses.

UNIT - I	**Simple Stresses and Strains:**	**(08 Hours)**
	Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law; Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section.	
UNIT - II	**Shear Force and Bending Moment in Beams:**	**(08 Hours)**
	Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments;	
UNIT - III	**Bending Stresses and Deflection of Beam:**	**(08 Hours)**
	Bending Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section. Deflection of Beams: Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.	
UNIT - IV	**Shear Stresses:**	**(08 Hours)**
	Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section. Torsion of Circular Shafts: Theory, assumptions and derivation of torsional	

	formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.	
UNIT - V	**Combined Stresses and Axially Loaded Column:**	**(08 Hours)**
	Combined Axial and Bending Stress: Concept; Resultant stress due to the axial load and uni-axial or biaxial bending; Core of section. Axially Loaded Long Columns: Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula, Determination of critical load.	
UNIT - VI	**Principal Stresses and Principal Planes:**	**(08 Hours)**
	Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.	
Assignments:		
1	Explain different types of stresses with practical example.	
2	Write physical properties of different metals.	
3	Draw shape of SFD and BMD for different types of loading.	
4	Draw SFD and BMD for beams.	
5	Draw bending stress distribution diagram across section	
6	Calculate bending stress at particular point.	
7	Draw deflected shape of beam for different support conditions.	
8	Calculate slope and deflection at particular point.	
9	Draw shear stress distribution diagram across section	
10	Calculate shear stress at particular point.	
11	Explain application of shafts in series and in parallel.	
12	Calculate twist/torque/stresses in shaft.	
13	Draw effect of combined axial and flexure stress.	
14	Draw deflected shape of column under different support conditions.	
15	Calculate critical load for column.	
16	Explain principal stresses and strains.	
17	Draw Mohr's circle for different stresses.	
Text Books:		
1) R. C. Hibbeler, "Mechanics of Materials", Pearson Prentice Hall,		
2) Rajput R. K., "Strength of Materials", S. Chand Publication		
3) Punmia B. C., Jain, Ashok Kr. Jain Arun Kr., "Mechanics of Materials", Laxmi Publication.		
4) Ramamrutham S. & Narayan R., "Strength of Materials", Dhanpat Rai Publishing Co.		
Reference Books:		
1) Beer F..P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication		
2) GereJ.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors		
3) Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication		

4) Popov E. P., “Engineering Mechanics of Solids”, Prentice Hall of India (P) Ltd.	
5) Singer F. L. & Pytel A., “Strength of Materials”, Harper and Row Publication	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

05: CONCRETE TECHNOLOGY

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Fundamentals of Civil Engineering
2.	Engineering Chemistry
Course Objectives:	
	The student should know qualities & properties of concrete.
Course Outcomes: The student will be able to	
1.	test Ingredients of concrete.
2.	measure Workability of concrete.
3.	measure strength of Hardened concrete.
4.	design of Concrete Mix.
5.	describe Durability of concrete.
6.	explain the use of Admixtures.

UNIT - I	**Ingredients of Concrete:**	**(06 Hours)**
	Cement: Manufacture of Portland cement, Chemical Composition, Bogues compounds, Hydration of cement, Structure of Hydrated cement, ASTM classification and types of cement, Tests of cement and I.S. requirements for ordinary Portland cement. Aggregates: Classification, Properties of aggregates, Deleterious materials, Soundness, Alkali-Aggregate Reaction, Grading of aggregates, Standard Grading curves, Testing of aggregates, Artificial & recycled aggregates. Water: Quality of water IS requirements, Use of sea water.	
UNIT - II	**Fresh Concrete:**	**(06 Hours)**
	Workability: Factors affecting workability, Measurements of workability, Suitability of concrete based on degree of workability, Segregation, bleeding. Concreting Process: batching, mixing, transporting, placing and compaction. Curing of Concrete: Methods of curing (study of machinery not expected), Effect of temperature on curing, Steam curing, curing compounds, period for curing, stripping time.	
UNIT - III	**Hardened Concrete:**	**(06 Hours)**
	Properties of Hardened concrete Strength of Concrete: General, Compressive strength, Factors affecting strength, Maturity Concept, Tensile strength, Relation between compressive and tensile	

	strength, Flexural strength, Testing under central and third point loading, Shear strength, Bond strength,Elasticity, Creep and Shrinkage: Stress-Strain relation, Modulus of Elasticity, Creep-time curve. Non Destructive Testing: Schmidth's Rebound hammer, Ultrasonic Pulse velocity method.	
UNIT - IV	**Concrete Mix Design:**	**(06 Hours)**
	Concept of mix design, Variables in mix design, Statistical Quality Control, Various methods of mix design, Design of mix by Indian Standard recommended method (IS: 10262 & IS: 456), Acceptance criteria.	
UNIT - V	**Admixtures in Concrete:**	**(06 Hours)**
	Purpose and functions, Classification Chemical Admixtures: Plasticizers, Super-Plasticizer, Retarders, Air entraining agents, Compatibility of admixtures and cement, Marsh Cone Test. Mineral Pozzolanic/Admixtures:- Fly ash, Silica flume. Self Compacting Concrete, Roller Compacted Concrete, Ready mix concrete; High Performance Concrete.	
UNIT - VI	**Special Concrete and Durability of Concrete:**	**(06 Hours)**
	Special Concrete: Light weight concrete, Polymer Concrete, Fiber reinforced concrete, Ferro-cement. Special Concreting: Under water concreting, Cold weather concreting. Durability of Concrete: Definition, Significance, Strength and durability relationship; Permeability, Chemical attack; Sulphate attack; Chloride attack, attack by sea water, Carbonation and measurement of depth of carbonation, Requirement for durability as per IS 456.	

ASSIGNMENTS:

1) To find the types of cement from market.
2) To find the different types, sizes, shapes of aggregate from market.
3) Measurement of workability of fresh concrete by different methods.
4) Describe the concreting process from any nearby site.
5) Describe the curing of concrete.
6) Design the concrete mix by different method.
7) Measurement of strength of hardened concrete.
8) Measurement of strength of hardened concrete by nondestructive testing.
9) Describe the concept of durability of concrete.
10)Explain the use of Admixtures in concrete.

Text Books:

1) Gambhir M. L., “Concrete Technology”, Tata McGraw Hill Publication
2) Shetty M. S., “Concrete Technology”, S. Chand & Company Ltd.

Reference Books:

1) Neville A. M. & Brooks J. J., “Concrete Technology”, Pearson Education Publication

2) Neville A. M., “Properties of Concrete”, ELBS & Longman Publication	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

07: COMPUTER APPLICATIONS IN CIVIL ENGINEERING - II

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: --	End Semester Examination: --	--
Practical: 02 Hours / Week	Continuous Assessment: --	
	Term Work: 50 Marks	01 Credit

Course Pre-requisites:

The Students should have

1.	Knowledge of basic building aspects.
2.	Knowledge of various building components.
3.	Knowledge of various building symbols.

Course Objectives:

	To make student capable of drawing any kind of Engineering drawing using AutoCAD.

Course Outcomes:

The students will be able to

1.	draw various Engineering drawing using AutoCAD.
2.	draw various elements of a building.
3.	draw various elevation and sections of the building.

	CIVIL ENGINEERING SCOPE AND APPLICATIONS II	
•	Introduction.	
•	Getting Started.	
•	Learning commands: Draw and Modify Menu.	
•	Learning commands through drawings.	
•	Centerline drawings	
•	Layers / Filters	
•	Blocks	
•	Area Command	
•	Drawing Presentation :Sheet size and Text Format	

Term Work:

1) Introduction to the software: Tool bars, Symbols and Various Commands.
2) Drawing Plates (minimum 10 in number)
3) Drawing Plan, Elevation and Section of G+1 Building.

Text Books:

AutoCAD users Guide

08: TESTING OF MATERIALS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Practical: 02 Hours / Week	TW&Oral:50Marks	01 Credit

Course Pre-requisites:

The Students should have

1.	knowledge of Engineering Mechanics,Solid Mechanics & Concrete Technology.

Course Objectives:

	the student should able to test qualities & strength of the material.

Course Outcomes:

The student will be able to test

1.	Metals
2.	Cement
3.	Aggregates
4.	Concrete

Course Contents:

The term work shall consist of minimum **TWELVE** experiments from list below.

	Metal: (min Four)
1	Tension Test – Mild steel, Tor steel
2	Torsion test- Mild Steel
3	Direct Shear test- Mild Steel
4	Izod & Charpy Impact tests- Mild Steel, Aluminum, Brass, Copper
5	Rockwell Hardness test- Mild Steel, Aluminum, Brass, Copper
	Cement: (min Two)
6	Standard consistency and Setting time test on cement
7	Fineness test on Cement
8	Compressive strength of Cement
9	Soundness test on Cement
	Aggregate: (min Two)
10	Specific gravity of Aggregates
11	Fineness Modulus of Aggregate
12	Aggregate Impact Value
13	Aggregate Crushing Value
	Concrete (min Four)
14	Workability of Concrete & effect of admixture.
15	Compressive strength of Concrete
16	Flexural Test of Concrete
17	Split Tensile strength of Concrete
18	Non Destructive Test on concrete –Schmidth's Rebound hammer test
19	Bending test – Timber
20	Compressive Strength test- Bricks

Reference Books:

01) Neville A. M. & Brooks J. J., "Concrete Technology", Pearson Education Publication

02) Neville A. M., "Properties of Concrete", ELBS & Longman Publication

03) IS Codes

- IS-4926
- IS-516
- IS-2386
- IS-1199
- IS-383
- IS-13360
- IS-5242

09: ENGINEERING MATHEMATICS-III

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Tutorial: 01 Hours / Week	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have

1.	basic knowledge of differentiation, integration and differential equation
2.	basic knowledge of vector algebra

Course Objectives:

	To form mathematical model and solve mathematical problem in Civil Engineering

Course Outcomes:

The student should be able to

1.	form mathematical modeling of systems using differential equations and solve the differential equations
2.	apply Vector differentiation and integration that finds applications in solid mechanics, fluid flow, heat problems and potential theory etc
3.	analyze the numerical data by applying statistical methods
4.	solve system of linear equation and ordinary differential equation by numerical methods
5.	apply mathematical modeling of systems using partial differential equations and solve the partial differential equations.
6.	apply vector integral calculus to solve various problems in Civil Engineering.

Unit - I	**Unit I: Linear Differential Equations (LDE)**	**(06 Hours)**
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE.	
Unit - II	**Unit II: Applications of DE**	**(06 Hours)**
	Modeling of problems on bending of beams, whirling of shafts and mass spring systems. Solution of Partial Differential Equations (**PDE**): 1) $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$, 2) $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$, 3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ by using Separation of variables Applications of PDE to problems of Civil and allied engineering.	

Programme: B. Tech. (Civil) – Sem IV - 2014 Course

Unit - III	**Unit III: Numerical Methods**	**(06 Hours)**
	Numerical solutions of (i) System of Linear Equations by Gauss Elimination, Cholesky and Gauss-Seidel methods (ii) Ordinary Differential Equations by Euler's, Modified Euler's, Runge-Kutta 4^{th} order and Predictor-Corrector methods.	
Unit - IV	**Unit IV: Statistics and Probability**	**(06 Hours)**
	Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis,Correlation and Regression, Reliability of Regression Estimates. Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial,Poisson, Normal and Hypergometric; Test of Hypothesis: Chi-Square test	
Unit - V	**Unit V: Vector Differential Calculus**	**(06 Hours)**
	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl,Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities	
Unit - VI	**Unit VI: Vector Integral Calculus**	**(06 Hours)**
	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equations.	

ASSIGNMENTS:

1. Problems on Linear differential equation with constants coefficients.
2. Problems on Application of LDE and partial differential equations.
3. Problems on Numerical methods to solve system of algebraic equation and ordinary differential equation.
4. Problems on Statistical methods and probability distribution.
5. Problems on Vector identities and application of vector differential in mechanics.
6. Problems on Line integral, surface integral and volume integral .

Text Books:

1)Peter V. O'Neil Advanced Engineering Mathematics by (Cengage Learning).

2)Erwin KreyszigAdvanced Engineering Mathematics by (Wiley Eastern Ltd.).

Reference Books:

1)B.V. Raman Engineering Mathematics by Tata McGraw-Hill.

2)M. D. Greenberg Advanced Engineering Mathematics, 2E, by Pearson Education.

3)Wylie C.R. & Barrett L.C. Advanced Engineering Mathematics, McGraw-Hill, Inc.

4)B. S. Grewal Higher Engineering Mathematics by Khanna Publication, Delhi.

5) P. N. Wartikar& J. N. WartikarApplied Mathematics Volumes I and II Pune VidyarthiGrihaPrakashan, Pune.

Syllabus for Unit Test:	
Unit Test I	Unit - I, II, III
Unit Test II	Unit - IV, V, VI

10: SURVEYING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTED:**
Theory : 3 Hrs/ Week	End Semester Exam: 60Marks	03 Credits
Practical : 4 Hrs/ Week	Continuous Assessment : 40Marks	
	Term Work & Practical Exam: 50 Marks	01 Credit

Course Pre-requisites:	
The Student Should have	
1.	Basic concept of civil engineering.
2.	Basics of mathematics and Geometry.
Course Objective	
1.	To make students understand use of various instruments and process of surveying and levelling.
Course Outcomes	
The student should be able to	
1.	Explain the use of linear measurements and prismatic compass in surveying.
2.	Describe the process of vertical measurements and contouring and calculate reduced levels.
3.	Describe the use of vernier theodolite for angular measurements and calculate coordinates of traverse stations.
4.	Calculate omitted measurements in traverse survey and describe permanent adjustments of theodolite.
5.	Explain various methods of setting out curves and describe field procedure of curve setting.
6.	Explain use of plane table and minor instruments in surveying.

UNIT-I	**Linear measurement and Compass survey**	**(06 Hours)**
	Introduction to land surveying, linear measurements, Tapes and EDM- Construction, working and principle, Direct and Indirect methods of linear measurement and ranging, types of tapes, , locating details with offsets by swinging tape, open cross staff and laser square method, concept of scale, R.F. maps and plan. Study and use of topo sheets. Compass survey: Types of bearing and meridian other than magnetic meridian, local attraction and correction of local attraction, dip, declination, reduction of true bearings, adjustment of closing error.	
UNIT-II	**Vertical measurements and contouring.**	**(06 Hours)**
	Instruments for vertical measurement-dumpy level, auto level, laser level and digital level. Principle axes of dumpy level, temporary and permanent adjustment, simple, compound and reciprocal levelling, curvature and refraction corrections, distance to the visible horizon. Contouring: Direct and indirect methods of contouring, uses of contour maps, profile levelling and cross sectioning and their applications, reduction of volume from contour map and tracing grade contour.	
UNIT-III	**Measurement of direction by Vernier Theodolite.**	**(06**

		Hours)
	Study of Vernier transit 20" Theodolite, introduction to digital Theodolite use of Theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles and magnetic bearing, prolonging a line, lining in and setting out and angle with a Theodolite, plane trigonometrical levelling. Theodolite traversing: computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch's rule, Gales traverse table.	
UNIT-IV	**Omitted measurements, permanent adjustments of transit Theodolite and Tachometry.**	**(06 Hours)**
	Omitted measurements, area calculation by independent co-ordinates, open traverse and its uses, measurement of deflection angles using transit Theodolite, open traverse survey and checks in open traverse. Fundamental axes of Theodolite: testing and permanent adjustment of Theodolite Tachometry: applications and limitations, principle of stadia tachometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points.	
UNIT-V	**Curves**	**(06 Hours)**
	Introduction to horizontal and vertical curves, different types and their applications, simple circular curves, elements and setting out by linear methods, offsets from long chord and offsets from chord produced, angular method, Rankin's method of deflection angle. Transition curves: necessity, types and requirements.	
UNIT-VI	**Plane table survey and construction survey.**	**(06 Hours)**
	Equipments required for plane table survey and their uses, methods of plane table survey: radiation, intersection, traversing, and simple resection, errors and precisions in plane table surveying, construction survey- survey for tunnels, drainage line buildings, and roads. Use of laser based electronic range finder.	
	Term work:	
	The term work shall consist of	
	Field book containing record of all exercises and project listed below.	
a)	Road project showing L-section plan Of road with contours and typical cross section	**2-sheets**
b)	Theodolite traverse survey project.	**1-sheets**
	List of Practicals:	
	Details of practicals to be performed, Exercise projects and assignments	
1.	Linear measurements with tape and accessories.	
2.	Study and use of auto level and double check leveling	
3.	Compound leveling and fly leveling, calculation by rise and fall method.	
4.	Two peg test for level.	
5.	Study and use of 20" Vernier Theodolite.	

6.	Measurement of horizontal angle of triangle by repetition method and applying check.	
7.	Measurement of vertical angle by transit Theodolite	
8.	Trigonmetrical levelling by transit Theodolite.	
ProjectI	Road project of minimum length of 250 M including fixing of alignment, profile leveling and cross sectioning.	
ProjectII	Theodolite traverse survey of closed traverse for minimum 0.5 hectares area including building roads etc.	
9.	Computation of horizontal distance and elevation of points by tachometry for horizontal and inclined sights.	
10.	Introduction and study of outfit of plane table and method of radiation.	
11.	Intersection method of plane table survey.	
12.	Closed plane table traverse survey around a small four sided building.	
13.	Setting out simple circular curve by Rankin's method of deflection angle	
14.	Use of laser based electronic range finder.	
	ASSIGNMENTS:	
1	Computation of corrected bearings of the traverse by different methods.	
2	Solving problems on calculation of reduced levels by different methods.	
3	Preparing contour map of the area from the given spot levels.	
4	Study of topographical sheets to record various details shown.	
5	Solving problems on trigonometrical leveling.	
6	Computations of independent coordinates of a closed traverse.	
7	Solving problems on omitted measurements.	
8	Calculation of reduced level and distance of a point by tacheometry.	
9	Computation of data required to set out the simple circular curve by Rankine's method .	
10	Write details of survey for drainage line with proper sketches.	
	Text Book:	
1	Surveying and Levelling by Vol.II-T.P. Kanetkar and S.V. Kulkarni.	
2	Surveying Vol. I & II by Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain.	
3	Surveying for Engineers- John Uren & Bill Price- Palgrave Macmillan	
4	Plane Surveying------A.M. Chandra----- New age International Publishers	
5	Surveying and Levelling --- N. N. Basak, Tata Mc-Graw hill	
6	Surveying Vol. I & II---- Dr. K. R. Arora.	
	Reference Books:	
1	Surveying: Theory and practice---James M. Anderson, Edward M. Mikhail	
2	Surveying theory and practices---Devise R. E., Foot F.S.	
3	Plane and Geodetic Surveying for Engineers. Vol. I—David clark.	
4	Principles of Surveying. Vol. I by J.G. Olliver, J.Clendinning	

5	Surveying Vol. I & II by S.K.Duggal, Tata Mc-Graw Hill.	
6	Surveying and Levelling by Subramanian, oxford University Press.	

Syllabus for Unit Test.

Unit Test I	**Units I, II, III**
Unit Test II	**Units IV, V, VI**

11. MECHANICS OF FLUID

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTED:
Theory : 3 Hours / Week	End Semester Exam: 60Marks	03 Credits
Practical : 2 Hours / Week	Continuous Assessment : 40Marks	
	Term Work & Oral Exam: 50 Marks	01 Credit

Course Pre-requsites:	
The Student Should have	
1	Basic Knowledge of units and conversion of units
2	Basic Knowledge of Engineering Mathematics
3	Basic Knowledge of Engineering Physics
Course Objective:	
	To make the student understand the scope and application of Fluid Mechanics
Course Outcomes:	
Student should be able to	
1.	describe basic properties of fluids and measure its properties in static conditions.
2.	apply knowledge of fluid kinematics and dynamics conditions.
3.	analyse physical phenomenon dimensionally.
4.	explain laminar flow and flow through pipes
5.	explain of boundary layer theory.
6.	describe turbulent flow.

Unit -I	**Properties of Fluids & Statics:**	**(06 Hours)**
	Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids. **Statics:** Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height.	
Unit II	**Kinematics**	**(06 Hours)**
	Types of flow, path lines and streak lines, stream lines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net.	

Unit III	**Kinetics**	**(06 Hours)**
	Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, , Impulse momentum equation.	
Unit IV	**Dimensional Analysis and Model Studies**	**(06 Hours)**
	Dimensional homogeneity, Important dimensionless parameters, Dimensional analysis using Buckingham's π theorem, Model studies, Similitude, Model laws, Types of models.	
Unit V	**Fundamental of Pipe Flow & Boundary layer theory**	**(06 Hours)**
	Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe ,Hagen Poisullies Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of boundary layer, Boundary layer thickness, Velocity distributions within boundary layer	
Unit VI	**Turbulent flow & Pipe Flow Problems**	**(06 Hours)**
	Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Pipe network Analysis, Siphons, Hydraulic transmission through pipes, three reservoir problems.	
Term work shall consist of any Eight Exercises		
1.	Determination of Viscosity	
2.	Study of Pressure Measuring Devices	
3.	Study of Stability of Floating Bodies	
4.	Verification of Bernoulli's Theorem	
5.	Determination of C_d of Venturimeter	
6.	Determination of C_d of Orifice	
7.	Determination of C_d of Notch	
8.	Study of Laminar flow Using Heleshaw's /	
9.	Study of Laminar flow Using Reynold's Apparatus	
T.W and Oral Examination shall be based on above termwork		
ASSIGNMENTS : Assignments will consist of		
1. Solution of numerical problems asked in recent three years of BVU question papers.		
2. Solution of questions asked in recent three years BVU question papers.		
3. Report of new topic being discussed in reputed research journals related to fluid mechanics.		

4. Mini projects such as collection of information, Brochure, Data, on a topic related to fluid mechanics.
5. Writing of industrial applications of various topics of syllabus.
6. Design of new experiments related to fluid mechanics.
7. Collection of two fluid mechanics NPTEL videos and demonstration of it.
8. Collection of information about fluid mechanics equipment's /machinery/materials related to fluid mechanics.
9. Collection of information about fluid mechanics phenomenon and its explanation.
10. Collection of data of different fluids with reference to their properties.

Text Books:	
1.	Garde R. J. and Mirajgaonkar "Engineering Fluid Mechanics" Scitech Pulication
	C.P.Konthadraman "Fluid Mechanics And Machinery" New Age Publications
2.	S. Ramamurtham "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat Rai Publishing Company
3.	R. K. Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publications
4.	R.K. Rajput "Fluid Mechanics" S Chand Publications
5.	Garde R. J. and Mirajgaonkar "Fluid Mechanics Through Problems" , New Age International New Delhi
6.	Modi P.N. and Seth S.M. " Fluid Mechanics" Standard Book House
Reference Books:	
1.	Streeter- Wylie,"Fluid Mechanics", TataMcGrow Hill Publication
2.	Dr. R. J. Garde "Turbulent Flow" New Age Publications
3.	N. Narayana Pillai "Principles of Fluid Mechanics and Fluid Machines" University Press
4.	Edward J. Shaughnessy "Introduction to Fluid Mechanics" Oxford University Press
5.	Baljeet S. Kapoor "Fluid Mechanics" New Age International Publishers
6.	Vijay Gupta "Fluid Mechanics And Its Applications" New Age International Publishers
7.	Robert W. Fox "Introduction to Fluid Mechanics" Willey Student Edition
8.	John F. Douglas "Fluid Mechanics" Perason Publication
9.	James A. Fay "Introduction to Fluid Mechanics" PHI Learning Private Limited

Syllabus for Unit Test	
Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

12: CONSTRUCTION TECHNIQUES & MACHINERIES

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination : 60 Marks	03 Credits
	Unit Test : 20 Marks	
	Assignment : 10 Marks	
	Attendance : 10 Marks	

Course Pre-requisites:

The Students should have

1.	knowledge of Building Construction Practices, Building Planning & Design.
2.	knowledge of Engineering Economics.
3.	knowledge of Concrete Technology.

Course Objectives:

	Students should get knowledge of Construction Operation Equipments & different methods of advanced construction techniques, tunneling, concreting & dewatering.

Course Outcomes:

1.	Student will be able to explain erection techniques for high rise structures.
2.	Student will be able to Apply different construction techniques in underwater construction.
3.	Student will be able to apply grouting techniques.
4.	Student will be able to find output of earth moving equipment.
5.	Student will be able to explain soil stabilization techniques.
6.	Student will be able to describe safety of equipment

UNIT - I	**CONSTRUCTION MECHANISATION & HIGH RISE CONSTRUCTIONS**	**(06 Hours)**
	Role of Construction activity in the National (including Urban & Rural) & Global development. Necessity of mechanization in construction industry. Types of construction such as Light, Medium & Heavy duty. Erection techniques for high rise structures, advantages & disadvantages of high rise structures. Scope of infrastructure in India and provisions made.	
UNIT - II	**UNDER WATER CONSTRUCTION**	**(06 Hours)**
	Cofferdams Dams & Caissons – Definition, Classification & its use. Dredging Techniques. Construction under deep water (Tremie Method). Classification & different types of Piles, Sheet Piles, Pile driving techniques, Negative skin friction. Use of special types of Formwork. Jetties.	
UNIT - III	**ADVANCED CONSTRUCTION TECHNIQUES**	**(06 Hours)**

	Launching of Girders, Precast Techniques, Tunnel Driving techniques, Tunnel boring machines (Open & Shield), Road Headers & Boomers, Placing of concrete in Hot & Cold weather conditions. Shotcreting & Gunieting. Trenchless Technology, Micro Tunneling. Pneumatic Drilling equipments. Drill & Blast method.	
UNIT - IV	**EARTH WORK MACHINERIES**	**(06 Hours)**
	Classification of Earth Moving machines (rippers, dragline, scrappers, pavers, backhoe) & factors affecting in selection. Group behavior of equipments. Manpower requirement for the equipments. Rollers, Tractors, Bull Dozers, Rippers, Draglines & Clamp Shells, Scrappers, Dumpers, Pavers, Power Shovels, Backhoe -: detailed study of these equipment with classification, uses, output, & economics. Excavating, Transporting & compaction equipments. Importance of record keeping of machineries & mode of payment for them.	
UNIT - V	**HOISTING & CONVEYING EQUIPMENTS**	**(06 Hours)**
	Hoisting & Transporting equipment; types (Derrick, Tower & Mobile), factors affecting for selection. Conveying equipments-: belt, apron, vibrating, pneumatic, flight & spiral or screw conveyors. Hauling equipments. Crushers & its types.	
UNIT - VI	**DEWATERING, PAVING EQUIPMENTS & CONCRETE PUMPS**	**(06 Hours)**
	Dewatering Techniques; Electro-osmosis method, Well Point System. Paving Equipments; Types, Uses. Asphalt Pavers, Slip Form Pavers, Concrete Pavers. Pumps; Types & Uses. Pumps for concreting.	

ASSIGNMENTS :

1) Enlist & explain role of construction activity in National & Global development. Explain scope of infrastructure in India & provisions made.
2) Define with examples; Light, Medium & Heavy construction.
3) Define & differentiate between Cofferdams & Caissons & briefly explain piles & its classification.
4) In context of tunneling, enlist different tunnel driving techniques & tunnel boring machines.
5) Write short notes on -:
   i. Shotcreting
   ii. Gunieting
   iii. Trenchless technology
   iv. Drill & Blast method
   v. Pneumatic drilling equipments
6) Classify, discuss briefly various earth work machineries (any five) & factors affecting in

selection including their economics.
7) Classify & explain various hoisting & conveying equipment. Discuss in detail about factors affecting in selection of them & its economics.
8) Explain crushers & its types in detail.
9) Enlist & explain with neat diagrams, different dewatering techniques (electro-osmosis method, well point system).
10) Write a brief note on Pumps & its types. Discuss in detail about various pumps used for concreting.
11) Prepare a Power Point presentation (P.P.T.) on any of the topic of your choice from the entire syllabus after getting approval of topic from your subject teacher.
Textbooks / Reference Books:
1) Mahesh Verma, "Construction Equipment & Planning & Application", Metropolitan Book Company Private Ltd., New Delhi.
2) Peurifoy Robert L., William B. Ledbetter, "Construction Planning Equipment Methods", Mc Graw Hill Book Company.
3) Russel James E., "Construction Equipment", Reston Publishing Company.
4) Shetty M.S., "Concrete Technology – Theory & Practice", S. Chand & Company Private Limited.
5) S.C. Sharma & Khanna, Construction Equipments & its Management",
6) V.R. Phadke "Construction Machinery & Works Management".

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

13: STRUCTURAL ANALYSIS - I

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Tutorial: 01 Hours / Week	Continuous Assessment: 40 Marks	

Course Pre-requisites: The students should have knowledge of	
1.	Solid Mechanics
Course Objectives:	
	The student should be able to analyse the structure.
Course Outcomes: The student will be able to	
1.	calculate degree of indeterminacy of the structure.
2.	calculate deflection of truss.
3.	analyse Indeterminate truss using strain energy method.
4	calculate fixed end moments.
5	analyse plane structure using slope deflection method.
6	analyse plane structure using moment distribution method.

UNIT - I	**Basic Concepts:**	**(06 Hours)**
	Types and classification of skeletal structures, members, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beam and frame. Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axially force, shear force, bending moment and torsional moment.	
UNIT- II	**Deflection of Beam and Truss:**	**(06 Hours)**
	Deflection of determinate beam using conjugate beam method, Deflection of joints of determinate truss using Castigliano's first theorem	
UNIT-III	**Analysis of Indeterminate Plane Trusses using Castigliano's theorem:**	**(06 Hours)**
	Analysis of indeterminate trusses by application of Castigliano's second theorem; Effect of Lack of fit, temperature changes and Sinking of support.	
UNIT - IV	**Fixed Beam and Clapeyron's Three Moment Theorem:**	**(06 Hours)**
	Fixed Beam: Calculation of fixed end moments due to different types of loads; Effect of sinking of support. Clapeyron's Three moment theorem: Analysis indeterminate beams using three moment theorem for different support conditions; Effect of sinking of support.	
UNIT - V	**Slope Deflection Method:**	**(08 Hours)**

	Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of non- sway and sway rectangular portal frames (with indeterminacy up to 3 degrees);	
UNIT - VI	**Moment Distribution Method:**	**(08 Hours)**
	Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of non-sway and sway rectangular portal frames (with indeterminacy up to 3 degrees).	

Assignments:		
1	Draw different types of structures- space, plane, trusses, beams and frames.	
2	Draw deflected shapes of different types of structures	
3	Calculate degree of static indeterminacy.	
4	Calculate degree of kinematic indeterminacy.	
5	Calculate deflection of beam using conjugate beam method.	
6	Calculate deflection of truss using Castigliano's first theorem.	
7	Analysis of indeterminate trusses using Castigliano's second theorem	
8	Write fixed end moments for different loading cases.	
9	Explain three moment theorem	
10	Analysis beam/frame using slope deflection method	
11	Calculate distribution factor at joint.	
12	Analysis non-sway beam/frame using moment distribution method	
13	Analysis sway frame using moment distribution method	

Text Books:

1) Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication
2) Pandit G. S. & Gupta S. P., “Theory of Structures Vol-I”, Tata McGraw Hill Publication
3) Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company

Reference Books:

1) Prakash Rao D. S., “Structural Analysis”, Universities Press Publication
2) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication
3) Aslam Kassimali, “Structural Analysis”, Cengage Learning.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

15: COMPUTER APPLICATION IN CIVIL ENGINEERING - III

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Practical: 02 Hours / Week	Term work and Practical: 50 Marks	01 Credits

Course Pre-requisites: The students should have knowledge of

1.	Engineering Mechanics
2.	Solid Mechanics
3.	Structural Analysis-I

Course Objectives:

	The student should be able to analyse the structure using STAAD.Pro

Course Outcomes: The student will be able to

1.	analyse the beams
2.	analyse the plane frames.
3.	analyse the plane truss.
4	Analyse the structure space.

	Introduction to STAAD.Pro: Application of software, Getting started, Introduction to Tool bars, Menu bar, working window, settting units, , Local and Global Co-ordinate system etc.	
	Generation of Model: Generation of skeletal model, Defining cross section and section properties, Generate and assign different types of supports, assign different types of nodal and member loads, Define load combination, analysis, static check, load list, post analysis, run analysis, read input file etc	
	Results and Interpretation: Post analysis, extract output/result of axial force, shear force, bending moment, torsional moment, deflection and stresses-their values and graphs. Results from output file, read output file and Interpret the results.	

Term work: Term work consist of assignments on

1) Analysis of beams
2) Analysis of plane frames
3) Analysis of plane trusses

Practical: The practical examination is based on above syllabus and term work.

Reference Books:

1) T.S. Sharma, “Staad.Pro v8i for beginners” , Notion Press
2) Sivakumar Naganathan, “Learn Yourself STAAD.Pro V8i”,Lap Lambert
3) Bentley Structures, “Staad.Pro Technical reference manual”, Bentley Community e-book

16: CIVIL ENGINEERING CONSTRUCTION PRACTICE

TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDITS ALLOTTED**
Practical: 02Hrs/Week	TW & Oral Exam: 50 marks	01Credits

Course Pre-requisites:	
The Student Should have knowledge of	
1.	Fundamental of Civil engineering.
2.	Building Construction
3.	Engineering mathematics.
4.	Concrete Technology
5.	Building Planning, Designing and Bylaws
Course Objective	
1.	To make students understand Civil Engineering Practices.
Course Outcomes	
The students will be able to	
1.	setout of foundation for buildings.
2.	carry out testing of construction materials
3.	manage inventory on site.
4.	maintain quality control on site.
5.	work as a site engineer
	List of Practicals (Any 10)
1.	Setting out and layout of building foundation.
2.	Study of various types of drawings required on construction sites
3.	Study of reinforcement and its bending for different structural members.
4.	Slump test on concrete and effect of plasticizers.
5.	Study of formwork& scaffolding.
6.	Construction of different types of brick masonry bonds, study of recent types of bricks and blocks
7.	Study of plastering & pointing.
8.	Study of different types of tiles.
9.	Introduction to water supply & sanitary fittings and appliances.
10.	Consealed construction practices.
11.	Types of paints.
12.	Methods of Waterproofing of toilets & roofs.
13.	Testing of concrete cubes of of different grades.
14.	Study of stock register format and daily report.
15.	Study of construction of concrete walls
16.	Study of precast techniques
17.	Study of Deck Slab
18.	Study of Advance Water proofing Techniques
Reference Books:	
1.	A to Z Building Construction by Mantri publication.
2.	My Construction Practices by R.B. Chaphalkar.

Programme: B. Tech. (Civil) – Sem V - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
31.	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32.	Advanced Surveying	3	2	--	60	20	10	10	50	--	150	3	1	4
33.	Engineering Project Management	3	2	--	60	20	10	10	50	---	150	3	1	4
34.	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35.	Advanced Mechanics of Fluid	3	2	--	60	20	10	10	50	----	150	3	1	4
36.	Professional Skill Development-V	4	--	--	100	--	--	--	--	---	100	4	--	4
	Total	**20**	**08**	**1**	**400**	**100**	**50**	**50**	**200**	**--**	**800**	**21**	**4**	**25**

*End Sem Exam of duration 4 hours.

Optional Subject

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

Programme: B. Tech. (Civil) – Sem VI - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
37.	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38.	Environmental Engineering-I	3	2	--	60	20	10	10	--	50	150	3	1	4
39.	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40.	Geotechnical Engineering	3	2	--	60	20	10	10	50	---	150	3	1	4
41.	Elective-I	3	--	--	60	20	10	10	--	----	100	3	--	3
42.	Professional Skill Development-VI	4	-	--	100	--	--	--	--	---	100	4	-	4
	Total	**19**	**08**	**2**	**400**	**100**	**50**	**50**	**150**	**50**	**800**	**21**	**4**	**25**

*End Sem Exam of duration 4 hours.

Total Credits

Semester V = 25

Semester VI = 25

Grand Total = 50

31 Structural Design-I*

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 4 Hours / Week	End Semester Examination: 60 Marks	Theory :5
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial : 1 Hours / Week	Term Work & Oral : 50 Marks	Termwork: 1

Course Pre-requisites:

The Students should have knowledge of

1.	Structural Analysis- I
2.	Mechanics of Solids

Course Objectives:

	To make student capable to design different structural elements using steel.

Course Outcomes:

The student will be able to

1.	estimate design load
2.	design a connection for axial load
3.	design a members for axial tension
4.	design a members for axial compression
5.	design a built up column
6.	design a beam

UNIT - I	**Design Philosophy**	**(06 Hours)**

	Types of structural elements and their behavior, Introduction to IS:875, Types of Loads, Estimation of Loads, Wind Load on Roof Truss. Load combinations, Design Load, Steel as a structural material, Type of structural steel, Mechanical Properties, Rolled steel sections and engineering properties, Introduction to SP6(1), Strength of Section, Design strength, Partial safety factors, Concept of Limit state design, Introduction to IS:800.	
UNIT - II	**Design of Connections for Axial Load**	**(06 Hours)**
	Types of fasteners, advantages and disadvantages, Types of bolts, Design strength of bolts, Design of bolted connection and detailing, Strength of weld, Design of weld and detailing.	
UNIT - III	**Design of Axially Loaded Tension Members**	**(06 Hours)**
	Behavior of member in tension, Axial tension capacity of plates, single and double angles and channel section, Design of axially loaded Tension members.	
UNIT - IV	**Design of Axially Loaded Compression Members**	**(06 Hours)**
	Behavior of member in compression, Concept of Effective Lengths, Axial compression capacity of single and double angle section, Design of axially loaded compression members	
UNIT - V	**Design of Built up Column and Column Base.**	**(06 Hours)**
	Axial compression capacity of Built up Column, Design of built up column, Design of Lacing system, Design of battening system, Design of slab base, Design of gusseted base.	
UNIT - VI	**Design of Beams**	**(06 Hours)**
	Behavior of beams, Shear and moment capacity of Laterally supported and laterally unsupported beam. Design of beam, Design of built up section, Curtailment of plates, Design of bolted connections for shear and moment.	
Term Work: The term work shall consist of minimum any ONE projects with 2 numbers of half imperial sheets based on following topics:		

1) Design of roof truss: Load estimation, Analysis of truss, Design force for member, Design of Members, Design of connection, Design of Purlin, Drawing.
2) Design of Building: Load estimation, Analysis of frame, Design of Secondary beams, main beams, Columns, Beam to Beam, Beam to Column connections, column bases, etc.
Assignments:
1) Calculation of Wind load acting on the roof truss.
2) Design of bolted or welded connection for axial load.
3) Design of member for axial tensile load.
4) Calculate axial capacity of member in compression.
5) Design of lacing or battening connection for built up column
6) Calculation of moment and shear capacity of rolled / built up section.
Reference Books:
1) N. Subhramanian, " Design of Steel Structures", Oxford University Press
2) S. K Duggal, "Limit State Desin of Steel Structures", Tata McGraw-Hill Education
3) S.S.Bhavikatti, "Design of Steel Structures: By Limit State Method", I K International Pub
4) Dr. Ramchandra, "Limit State Design of Steel Structures", Scientific Publishers
5) M. R. Shiyekar, "Limit State Design in Structural Steel", Prentice-Hall of India
6) IS:800-2007, General Construction in Steel - Code of Practice"
7) IS:875-1987, "Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)"
8) IS:808-1989, "Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections"
9) SP-6(6)- 1972, "Handbook for Structural Engineers"

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

32: ADVANCED SURVEYING

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral: 50 Marks	Termwork:1

Course Pre-requisites:

The Students should have knowledge of

1.	Fundamentals of Civil Engineering
2.	Surveying

Course Objectives:

	To make student capable to use advanced surveying techniques for mapping

Course Outcomes:

The student will be able to

1.	explain Geodetic control survey and theory of errors.
2.	explain various features of modern Total Station for survey .
3.	describe principles and components of Space Based Positioning System and its applications .
4.	describe technique of Hydrographic Survey.
5.	explain basics of Remote sensing and Geographical information System and its applications
6.	describe the process of Aerial survey and its use in Surveying.

UNIT - I	**Geodetic Control Survey:**	**(6 Hours)**

	Introduction to geodetic control survey, System- Triangulation and Trilateration, Triangulation stations and figures, concept of base line. Types of errors, Probable error and its determination, Laws of weights, Method of least squares, Normal equation, Adjustment of triangulation figure.	
UNIT - II	**Total Station Survey:**	**(6 Hours)**
	Concept and necessity of an electronic total station instrument. Types of total station as per EDM , range and angle resolution system. Principle features of an ETS, temporary adjustments, On board programmes such as REM, RDM, Free stationing, resectioning etc. ,traverse survey with ETS. Concept of data down loading and post processing software, Errors in ETS survey.	
UNIT - III	**Space Based Positioning Techniques:**	**(6 Hours)**
	Introduction and concept, segments of SBPS- space, control and user. GNSS type SBPS in action-GPS, GLONASS, Compass. RNSS type SBPS in action-Quasi zenith, IRNSS. GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential. Access denial techniques and ephimeris. SBPS coordinates and heights. Surveying with SBPS. Errors in positioning with SBPS. Applications of SBPS	
UNIT - IV	**Hydrographic Survey**	**(6 Hours)**
	Concept, objects, Soundings and instruments and personnel required for sounding, methods of locating soundings. Three point problem and its solution by mechanical, analytical and graphical method. Tides and tidal gauges and establishment of MSL	
UNIT - V	**Photogrammetry**	**(6 Hours)**
	Elements of photogrammetry, types of photogrammetry. Aerial photographs their types and scale. Concept of relief displacement, Stereoscopy, parallax and mirror stereoscope, parallax equation and difference in elevation from differential parallax. Ground control. Procedure of aerial survey and flight planning.	
UNIT - VI	**Remote Sensing and Geographic Information System :**	**(6 Hours)**
	Remote sensing-concept, types –active and passive, components of remote sensing system, electromagnetic energy and spectrum,	

	atmospheric windows and spectral signature. Remote sensing platforms and sensors. Remote sensing data products, interpretation of remotely sensed images visual and digital. Limitations and applications of remote sensing. Concept and need of GIS, Components- people, procedure, hardware, software and data .Functions- Input, manipulation, management, Query analysis and Visualization. Application and limitations of GIS.	

Assignments:

1. Solution of problems on Laws of weights and normal equations.
2. Collection of information for various types of ETS used and available in the market and their salient features
3. Collection of information of SBPS of various countries and applications of SBPS.
4. Wrte a report on Instruments used for measurement of soundings.
5. Case studies on applications of Remote sensing and GIS.
6. Case studies on applications of Aerial survey.

Term Work: Any Ten Experiments

1 .Study and use of one second theodolite and measurement of horizontal angle

2. Measurement of horizontal angles by reiteration method and Measurement of vertical angle.

3. Study and use of total station.

4. Study and use of total station for traverse survey.

5. Applications of Total Station for REM, RDM.

6.Study and Use of Nautical Sextant for measurement of horizontal angles.

7. Study and Use of Mirror stereoscope to find air base distance. parallax bar and determination of difference in elevation by differential parallax

8. Study and use of parallax bar and determination of difference in elevation by differential parallax.

9. Adjustment of braced Geodetic quadrilateral
10. Study and use of Handheld GPS for traverse survey
11. Solution of three point problem in hydrographic surveying
12. Study of GIS software.
Text Books:
1.Duggal S. K., "Surveying Vol-1, Vol-2", Tata Mac Graw Hill pub. co., New Delhi
2.Punmia B. C., "Higher Surveying", Laxmi Publications, New Delhi
3. Chandra A.M. ,"Higher Surveying " ,New Age International Publishers,
4. Bannister A. and Raymond Baker , "Surveying" , Pearson Education
5 Anji M. Reddy, " Text book of Remote Sensing and GIS ", BSP BS Publications
Reference Books:
1.Uren J., W. F. Price, "Surveying for Engineers", Macmillan Pub
2.Wolf P. R., "Elements of Photogrammety", Mc Graw Hill
3.Agarwal C. S., Garg P. K., "Remote Sensing in Natural Resources", Wheeler Publishing
4. Lo C.P., Albert Yeung , " Concepts and techniques of GIS ", Printice Hall of India

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V ,VI

33: Engineering Project Management

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & oral: 50 Marks	Termwork -1

Course Pre-requisites:

The Students should have knowledge of

1.	Building construction.
2.	Building planning and design.

Course Objectives:

	To prepare the student to analyze the network and monitor and control the civil engineering projects.

Course Outcomes:

The student will be able to

1.	prepare organization chart.
2.	prepare a network and analyze by CPM and PERT methods.
3.	update network and carryout resource allocation
4.	carry out material management
5.	solve linear programming problem by graphical and simplex methods
6.	check quality parameters in construction process.

UNIT - I	**Introduction to Project Management**	**(06 Hours)**
	Importance, Objectives and functions of Management, Categories of Project, Project Life Cycle Concept, Importance of organizational	

	structures, types of organization, Project Manager education, experience, authority & responsibility.	
UNIT - II	**Project Planning & Scheduling**	**(6 Hours)**
	Gantt /Bar Charts and its limitations, Network planning, network analysis, C.P.M., P.E.R.T., Types of floats, Slack. Ladder network ,	
UNIT - III	**Project Monitoring & Control**	**(6 Hours)**
	Resource allocation, resource smoothening and leveling, crashing of network, direct cost and indirect cost, cost slope, updating of network,	
UNIT - IV	**Material Management**	**(6 Hours)**
	Objectives of material management, material requirement, scheduling, monitoring, inventory control, inventory classification, inventory management, economic order quantity, inventory models, ABC analysis	
UNIT - V	**Linear Programming**	**(6 Hours)**
	Identification & formulation of L.P. problem, requirements and assumptions of linear programming model, graphical method and simplex method	
UNIT - VI	**Total Quality Management**	**(6 Hours)**
	Importance of total quality management in construction process and steps involved, concept of quality control, quality assurance, quality management and TQM, study of various quality standards in construction, six sigma concept, designing of quality manual, checklist and inspection reports, necessity of MIS in management	

Assignments -:

1) Project Manager Education, experience, authority & responsibility.
2) Draw a bar chart for a building project.
3) Ladder network analysis.
4) ABC analysis of small building project.
5) Problems on linear programming, graphical and simplex method.
6) Total quality management.

Term Work :	
1.	Assignment on different types of organization and their flowcharts.
2.	Assignment on bar chart.
3.	Assignments on C.P.M. and P.E.R.T.`
4.	Assignment on resource leveling.
5.	Assignment on crashing of network.
6.	Assignment on updating of network.
7.	Assignment on ABC and EOQ analysis.
8.	Assignment on linear programming, graphical and simplex method.
9.	Study of quality control system of a construction project.
10.	Prepare a network for any construction project containing minimum 25 activities and find out total float and free float.
Text Books:	
1.	Construction Engineering and Management by S. Seetharaman, Umesh Publications, New Delhi.
2.	PERT & CPM principles & applications by L.S. Srinath, affiliated East West press Pvt. Ltd., New Delhi.
3.	Project Planning & control with PERT & CPM by Dr. B.C. Punmia, K.K. Khandelwal, Laxmi Publications (P) Ltd, New Delhi.
Reference Books:	
1.	Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.
2.	Construction Project Management Planning, Scheduling and controlling by K.K. Chitkara TMH Publishing Company, New Delhi
3.	Inventory Control by L.C. Zhamb, Everest Publishing House
4.	Project Management by Khatua, Oxford University Press
5.	Project Planning, Analysis selection, Implementation & Review by Prasanna Chandra, Tata McGraw Hill, New Delhi
6.	Civil Engineering Project Management by Alan C. Twort & J. Gordon Rees, Elsevier

Syllabus for Unit Test:	
Unit Test -1	**UNIT – I, II & III**
Unit Test -2	**UNIT – IV, V & VI**

34 Structural Analysis-II

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Structural Analysis- I
2.	Mechanics of Solids

Course Objectives:

	The student should able to analyse the structure.

Course Outcomes:

The student should be able to

1.	calculate plastic moment capacity of section.
2.	draw Influence Line Diagrams (ILD) for reaction, Shear Force and Bending Moment
3.	draw Influence Line Diagrams (ILD) for force in members of truss
4.	analyse three hinge arch
5.	analyse two hinge arch
6.	analyse frame using approximate method.

UNIT - I	**Plastic Analysis of Structure**	**(06 Hours)**

	Elastic and Plastic moment capacity, Plastic hinge, Shape factor, Collapse mechanism, Applications to continuous beams, Fixed beams, Single bay single storied rectangular frames.	
UNIT - II	**Influence Line Diagrams and rolling loads for beams:**	**(06 Hours)**
	Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. Muller-Breslau's principle and its application to above beams. Rolling loads - Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values.	
UNIT - III	**Influence Line Diagrams and rolling loads for truss:**	**(06 Hours)**
	Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.	
UNIT - IV	**Analysis of Three Hinged Arch**	**(06 Hours)**
	Concept and types of arches, Three hinged arches – analysis, Calculation of horizontal Thrust, Radial Shear, Normal Thrust and BM at a cross section.	
UNIT - V	**Analysis of Two Hinged Arch**	**(06 Hours)**
	Two hinged arches – Horizontal Thrust at support, Radial Shear, Normal Thrust and BM at a cross section. BM diagram for concentrated load and UDL.	
UNIT - VI	**Approximate Methods of the Analysis:**	**(06 Hours)**
	Approximate methods of analysis of multistoried, multibay, 2-D rigid jointed frames by i) Portal method ii) Cantilever method iii) Substitute Frame Method	

Assignments:	
1) Calculate Plastic moment capacity of the cross section	
2) Draw ILD for beams for reaction, SF and BM	
3) Draw ILDs for members of the Truss	
4) Analyse three hinged arch	
5) Calculate support reactions for two hinged arch.	
6) Analyse frame using any approximate method	
Reference Books:	
1) Hibbeler R. C., "Structural Analysis", Prentice Hall Publication	
2) Pandit G. S. & Gupta S. P., "Theory of Structures- Vol-II", Tata McGraw Hill Publication	
3) Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication	
4) Junnarkar S. B. & Adavi, "Mechanic of Structures", Charotar Publishing House	
5) Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

35 Advanced Mechanics of Fluids

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral : 50 Marks	Termwork : 01

Course Pre-requisites:

The Students should have knowledge of

1.	Fluid Mechanics basics, Types of flows, friction.
2.	Basic knowledge of Water retaining structure like dam, weir etc. irrigation channel.
3.	Basic knowledge of Drag & lift, unsteady flow.
4.	Basic knowledge of Hydro power plant.
5.	Basic knowledge of pumps.

Course Objectives:

	To impart knowledge of open channel flows and hydraulic machinery to students.

Course Outcomes:

The student will be able to

1.	Design most efficient channel section, find critical depth of a flow.
2.	Understand and apply knowledge of various flow profile and their characteristics.
3.	Find energy dissipated in a hydraulic jump.

4.	Calculate forces on vanes for different conditions.	
5.	Understand and apply knowledge of turbines.	
6.	Understand and apply knowledge of pumps.	
UNIT - I	**Uniform Flow in Open Channels:**	**(06 Hours)**
	Basic Equations: Continuity Equation, Bernoulli's Equation, & Momentum Equation as applied to open channel one dimensional flow, Velocity distribution in open channel, Chezy's & Manning's formulae, factors affecting Manning's roughness coefficient, Normal depth, Conveyance Section factor, Most efficient channel section, Specific Energy, Specific Energy diagram, Depth-Discharge diagrams, alternate depths, Critical depth, Critical slopes, Froude number, Specific Force, Specific force diagrams, Conjugate depths, Depth-Discharge diagrams with respect to specific force.	
UNIT - II	**Gradually Varied Flow in Open Channels:**	**(06 Hours)**
	Gradually and rapidly varied flows, their examples, Basic assumptions in the derivation of GVF, Differential equations of GVF, Various GVF profiles, and their characteristics.	
UNIT - III	**Rapidly Varied Flow:**	**(06 Hours)**
	Hydraulic Jump in Rectangular and Trapezoidal channels, Classification & Practical uses of Jump, Examples of occurrence of Hydraulic Jump, Conjugate Depths, Energy Dissipation in Hydraulic Jump, Location of Jump, Devices for measurement of velocity and discharge in open Channels, Stream gauging.	
UNIT - IV	**Unsteady Flow:**	**(06 Hours)**
	Types, Flow through openings under varying head, Flow Compressibility, Celerity of Elastic Pressure Waves, Water Hammer Phenomenon, Rigid & Elastic water Columns Theories, Simple cases neglecting Friction, rapid	

	acceleration of flow due to sudden opening of valve, surge tanks and their functions, Location and Classification.	
UNIT - V	**Fluid Flow Around Submerged Bodies:**	**(06 Hours)**
	Fluid Flow Around Submerged Bodies: Practical problems involving fluid flow around submerged bodies, Definition & Expression for Drag, lift, drag coefficient, Types of Drag.	
UNIT - VI	**Hydraulic Machines :**	**(06 Hours)**
	Impact of Jet: Force Exerted due to impact of jet on stationary and moving flat and curved plates using linear momentum Principle, Principle of angular momentum, Euler's Momentum Equation for Turbines. Element of Hydropower plant, Hydraulic turbines, Heads & efficiencies, Governing of turbines, Cavitation in turbines, Performance of turbines, Prediction of performance in terms of unit quantities and specific quantities, specific speed. Theory of centrifugal pump, Centrifugal head due to rotation, Heads & efficiencies, Cavitation, Prediction of performance in terms of specific quantities, specific speed, characteristic curves.	

Assignments (Any Six)

1. Solve Four Numericals to find out Critical Depth.
2. Solve Numerical on GVF to find out flow profiles
3. Solve Numericals on Hydraulic Jump to find out dissipation of energy.
4. Solve Numericals to find out forces on different types of vanes.
5. Solve Numericals on design of Turbines.
6. Solve Numericals on design of Pumps.
7. Collection & Study of Information Brochure about different Hydraulic Machineries.
8. Collection & Study of Information Brochure about Hydraulic Lab Supply Companies.

Term Work: (Any Eight)	
1. Flow around aerofoil.	
2. Flow around a Circular Cylinder.	
3. Impact of jet around flat / curved plate.	
4. Performance Curves of Hydraulic Turbine. Constant Head Characteristic Curve	
5. Characteristics of Centrifugal Pump.	
6. Uniform flow formulae of open channel.	
7. Velocity distribution in open channel flow.	
8. Hydraulic jump as energy dissipater.	
9. Characteristics of various GVF profiles.	
10. Design of Hydraulic Centrifugal Pump.	
11. Design of Hydraulic Turbine.	
12. GVF Computations by Direct Step Method.	
Text Books:	
1. Garde R. J., Mirajgaonkar A. G., "Engineering Fluid Mechanics", Scitech Publication, Chennai	
2. Rangaraju K. G., "Open Channel Flow", Tata McGraw Publication	
3. Streeter Wylie, "Fluid Mechanics", Tata McGraw Publication	
4. Subramanyam K., "Open Channel Flow", Tata McGraw Publication	
5. Ven Te Chow, "Open Channel Hydraulics", Tata McGraw Publication	
6. Zoeb Husain, Zanial Alimuddin , " Basic Fluid Mechanics and Hydraulic Machines" BSP Books Pvt. Ltd. Hyderabad	
Reference Books:	
7. Fox, McDonald, Pritchard, "Fluid Mechanics SI Version" Willey Student Edition	
8. Frank M. White, "Fluid Mechanics", McGraw Hills Series	
9. C P Konthadraman, R Roodramoorthy, "Fluid Mechanics &Machinery" New Academic Science	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

36: Professional Skills Development V

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTED:**
Theory: 4 Hours / Week	End Semester Examination: 100 Marks	4

Course Pre-requisites

The Students should have knowledge of

1.	Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2.	An overall idea about vocabulary, Public speaking skills taught in the last semester
3.	Knowledge of writing skills, importance of professionalism in emails and letters.
4.	Knowledge on handling criticism and the concept of conflicts.
5.	Awareness of the interpersonal skills like team work and its importance in the corporate sector.

Course Objectives

	The Professional Skills Development 5 is an extension of PSD- 4 with focus on the remaining topics of Aptitude, Reasoning and Grammar. The further complex concepts of Aptitude and Grammar aims to acquaint them with the topics and also provide them techniques to solve the question with tricks/methods in a very short period. The English communication and soft skills section of PSD-5 focuses on the higher aspects of soft skills training students on how to handle Group Discussions during placement process and other topics such as grooming them on how to handle conflicts effectively in the corporate scenario and also the correct attitude/approach to solve problems collectively from a team's perspective and also individually.

Course Outcomes

The student should be able to

1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics of tenses and Sub- verb agreement relevant from the recruitment point of view.

2.	Use Mnemonics, and learn appropriate strategies to handle complex topics in GDs and ways to handle them. Students would learn the appropriate ways of stating opinions, disagreeing or communicating during the Group Discussion Process.
3.	Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5.	Students would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life. It would be a continuation of the topic covered during the previous semester PSD-4
6.	Learn to handle Case studies effectively and incorporate the right approach towards Case Studies asked during the recruitment process.

Unit I	**Aptitude (Maths, Logical Reasoning, English)**	**(24Hours)**
	• Maths ▪ Time, Speed & Distance ▪ Time & Work ▪ Simple Interest & Compound Interest in continuation ▪ Maths Revision • Logical Reasoning ▪ Data Interpretation ▪ Data Sufficiency ▪ Set Theory & Syllogisms ▪ Reasoning Revision • English ▪ Grammar – II – (Adjective, Verb, Sub- Verb Agreement) ▪ Grammar- (Tenses) ▪ Vocabulary ▪ Verbal Ability- Revision	
Unit II	**Soft Skills & English Communication**	**(24Hours)**
		(6 Hours)
	• Situational Conversation • Situational Writing • GD Orientation • Mock GD-1 • Mock GD-2 • Mock GD-3	

	• Conflict Resolution • Problem Solving Skills • Time- Management Skills • Handling Case Studies • Management Games • Business Meeting Etiquettes	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		

37 Structural Design-II

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 1 Hour/Week	Term Work: 25 Marks	Termwork:1

Course Pre-requisites:

The Students should have knowledge of

1.	conditions of equilibrium, plotting Shear force and bending moment diagram of beams with various support conditions and various load combinations.
2.	Determination of bending stress and shear stress in beams.
3.	Concept of short, long columns, direct and bending stress, principal stress and strains.
4.	Concrete, concreting techniques and properties of concrete.
5.	Plastic theory, concepts of planning of staircase, planning of a building.

Course Objectives:

	The student should be able to complete the design and detailing of a G+2 storied R.C.C. building.

Course Outcomes:

The student will be able to

1.	differentiate between various design philosophies of R.C.C. and know the properties of materials used in R.C.C. and the partial safety factors in Limit State Method .
2.	differentiate between under-reinforced, over-reinforced and balanced section , analyse and design a singly reinforced, doubly reinforced and flanged beam by Limit State Method.
3.	design beams for flexure, shear, bond for various supporting conditions

4.	design different types of slabs and a staircase.	
5.	design short columns for axial load, uniaxial and biaxial bending by using SP-16.	
6.	design isolated column footings.	
UNIT - I	**Materials and Design Approach:**	**(6 Hours)**
	Introduction of R.C.C: Materials: Types of reinforcements, Study of properties of concrete and properties of steel. Introduction to design philosophies of R.C. Structures: Working Stress Method, Ultimate Load method, Limit State Method. Various limit states, semi-probabilistic approach, partial safety factors for materials and loads, various structural elements and loads on the elements, Load combinations.	
UNIT - II	**R.C. Sections in Flexure:**	**(6 Hours)**
	R.C. Sections in Flexure: Limit State Method: Assumptions, Strain variation diagram, Stress variation diagram; Concept of under reinforced, balanced, over reinforced section; Design parameters of a singly reinforced rectangular section, Moment of resistance of singly reinforced, doubly reinforced, rectangular, flanged section.	
UNIT – III	**Beams:**	**(6 Hours)**
	Design of Beams for Flexure, Shear, Bond : Behaviour of R.C .beam in shear, Shear failure, Shear strength of beam Without shear reinforcement, Design of shear reinforcement. Bond –Introduction, types of bonds, Code provision. Design of beams- Simply supported, cantilever, Continuous – Singly reinforced, doubly reinforced and flanged beam. Introduction to Redistribution of moments in beams: Assumption, Requirements of I.S.456-2000. Various load combinations in continuous beams.	
UNIT – IV	**Slabs:**	**(6 Hours)**
	Design of Slabs: One Way Slabs: Simply Supported, Cantilever, Continuous	

	Two Way Slabs: Various support conditions Design of Staircase: Dog legged, Open well	
UNIT – V	**Columns:**	**(6 Hours)**
	Design of Columns: Columns- Axially loaded short columns, requirements of minimum eccentricity; Design of short columns for axial load, uniaxial, biaxial bending (use of SP 16); Checking safety of column for biaxial bending	
UNIT-VI	**Footings:**	**(6Hours)**
	Design of Footings: Footings- Design of isolated column footing for axial load, uniaxial Bending.	

Term Work:

1. Design of G+2 storied building for gravity loads only. The design should include all types of slabs, beams, columns, footings and staircase (two flights) (Maximum three students in a group)

2. Report of a site visit related to building structure under construction.

3. Four half imperial drawing sheets .

Assignments : Any Six

1. Assignment based on various methods of design.

2. Assignment based on basic parameters in design-Limit State Method and Working Stress Method.

3. Assignment based on moment of resistance of a singly reinforced beam, doubly reinforced beam, flanged beam.

4. Assignment based on design of various types of slabs.

5. Assignment based on design of various types of beams.

6. Assignment based on staircase design.

7. Assignment based on design of various types of columns.

8. Assignment based on design of isolated footing.

9. Making the models of reinforcement in various types of slabs.

10. Making the models of reinforcement in various types of beams.

11. Making the models of reinforcement in columns.

12. Making the models of reinforcement in staircase.

13. Making the models of reinforcement in footing.

Text Books:

1.Dr. V. L. Shah and Dr. S. R. Karve- "Limit State Theory and Design", Pune Vidyarthi Griha Publications

2. Punmia, Jain and Jain, "Comprehensive Design of R. C. Structures", Standard Book House

3. S. S. Bhavikatti, "Design of R.C.C. structural elements", New Age International Ltd.

4. P. Dayaratnam, "Limit State Analysis and Design", Wheeler Publishing Company, New Delhi

5.P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi

6. Sinha R.C. "RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi

I.S.Codes :

1.I.S.456-2000, "Plain and Reinforced Concrete-Code of Practice"

2.I.S.875-1987 (Part I to V),"Code of Practice for Design Loads"

3.SP-16-1980, "Design Aids for Reinforced Concrete"

Reference Books:

1.N.Subramanian" Design of Reinforced Concrete Structures" Oxford University Press

2.M.Fergusson " R.C.Fundamentals" - Tata Mcgraw Hill

3.S.Unnikrishnan Pillai,Devidas Menon "Reinforced Concrete Design"-Tata Mcgraw Hill Companies

4.Dr.H.J.Shah "Reinforced Concrete –Vol.1 (Elementary Reinforced Concrete)" –Charotar Publications

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

38: Environmental Engineering I

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Practical : 50 Marks	Termwork : 1

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering chemistry.
2.	Engineering mathematics.

Course Objectives:

	To make student aware of water treatment, air pollution, solid waste management and environmental management

Course Outcomes:

The student will be able to

1.	Explain the water quality criteria and drinking water quality standards.
2.	Explain aeration and sedimentation process of water treatment.
3.	Describe filtration, disinfection and advanced water treatment processes.
4.	Enumerate the various aspects of air pollution.
5.	Describe the solid and hazardous waste management.
6.	Explain the aspects of environmental management.

UNIT - I	**Water-Quantity, Quality and Standard**	**(06 Hours)**
	Water: Surface water sources, Ground water Sources, Water demand and quantity, various demands, Conveyance of water, Factors affecting demand, Design period, population forecasting, **Quality of Water**: Various Sources, Common impurities and their effects, Physical, Chemical, Biological, radiological characteristics of water, Drinking water quality standards, **Flow sheets:** Water Treatment Plant (WTP) based on sources of Raw water for Rural and Urban	
UNIT - II	**Treatment-Aeration and Sedimentation**	**(06 Hours)**
	Aeration: Types of aerators, gravity aerator and fixed spray aerator. **Sedimentation:** Plain Sedimentation, Principles and types of plain Sedimentation, details of Sedimentation tank, types of tanks, inlet and outlet arrangements; Design criteria like surface overflow rate, detention time, weir loading, depth of tank. Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clari-flocculator; Tube settlers: Introduction, Design of Tube settler	
UNIT - III	**Treatment- Filtration, Disinfection and Advance Technology**	**(06 Hours)**
	Filtration: Necessity, mechanisms, Theory of filtration, types of filters, pressure filters, dual and multimedia filters, Different media, details of filter, Rapid sand filter and slow sand filter, design criteria, working and washing of rapid sand filter, design of rapid sand filter. **Disinfection**: Necessity, Different methods, chlorination, reactions involved, Free And combined residual chlorine, Break point chlorination. UV disinfection, Ozonation **Advance Treatment Methods:** Water Softening- Chemical and ion exchange methods, Fluoridation and defluoridation, desalination, membrane technologies.	
UNIT - IV	**Air Pollution and Control**	**(06 Hours)**

	Air Pollution: History of Air pollutants, Sources and classification of pollutants and their effects on human health, vegetation and property. Ambient air quality and emission standards, **Air Pollution Control:** Principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate Matter Control: settling chambers, cyclone separation, Wet collectors, fabric filters, and electrostatic precipitators.	
UNIT - V	**Solid and Hazardous Waste Management**	**(06 Hours)**
	Solid and Hazardous Waste Management: Introduction, Sources, Legislations, Waste Generation, Composition, Source reduction of wastes, Handling and segregation of wastes at source, storage and collection, Transport, Labeling and Handling of Hazardous Wastes, Waste processing, Composting, Solid Wastes Disposal in Landfills, secure landfills and landfill bioreactors, landfill remediation, **Integrated Solid waste management**: Principles and Elements of Integrated Solid waste management.	
UNIT - VI	**Environmental Management**	**(06 Hours)**
	Environmental Management: Introduction, Principle, Fundamentals **Environmental Management Systems-** Introduction, ISO 14000 series, Environmental Management Plan, Eco – labeling, **Environmental Management Tools:** Life Cycle Assessment (LCA): Environmental Impact Assessment (EIA) and Environmental Audits **Environmental Legislation:** Rules and Regulations of Environmental laws in India (Water and Air),	
Assignments:		
1. Draw and explain flow sheets of water treatment plant for different types of water sources		
2. Numericals on design of flocculator, sedimentation tank and tube settler.		
3. Information about various types of filtration units		
4. National ambient air quality standards and control methods of air pollutants		
5. Experiences of solid waste management.		

6. EIA studies	
Term Work: (Any Eight experiments)	
11.	Determination of pH and alkalinity of water samples
12.	Determination of Total Hardness and its components of water samples
13.	Determination of Chlorides of water samples
14.	Determination of Turbidity and optimum dose of alum for raw water samples.
15.	Determination of Optimum dose of chlorine and residual chlorine for water samples.
16.	Determination of calorific value and/or energy content of the solid waste.
17.	Determination of concentration of trace metals (Al, Mn, Cu, Ni, Zn, Pb, Cd, Fe, N, P. K) from water, solid waste, air and soil samples.
18.	Determination of PM 2.5 in ambient air samples.
19.	Determination of concentration of Particulate matter and gaseous pollutants in industrial stack.
20.	Determination of concentration of carbon di-oxide from ambient air/industry/automobile
21.	Site visit
22.	Study of EIA report of infrastructure project.
Text Books:	
4.	Wark Kenneth and Warner C.F, Air pollution its origin and control. Harper and Row Publishers, New York, 1981.
5.	Rao C.S., Environmental pollution control Engineering, New age international Ltd, New Delhi, 1995.
6.	Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.
7.	George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw- Hill, New York, 1993

8. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.

9. Dr. M. N. Rao and Dr. Razia Sultana, ' Solid and Hazardous Waste management' BSP Books Pvt. Ltd. 2012

10. I. V. Murali Krishna and Valli Manickam,'Environmental Management', BSP, Books Pvt. Ltd. 2014

Reference Books:

1. S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behavior, Wiley 1977.
2. Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
3. J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
4. Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006.
5. Solid Waste Management, Van Nostrand Reinhold Co. 1975
6. C.L. ell, Solid Waste Management, John Wiley, 1975
7. P.W. Powers. How to dispose of toxic substances and industrial Waste, Noyes Data Corporation, England, 1976.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

39 Estimating, Costing and Valuation

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	Termwork -1
Tutorial : 1 Hour/ week	Term Work & Oral : 50 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Building Construction and Building planning and Design.
2.	Structural Design I and Structural Design II.
3.	Surveying and leveling
4.	Environmental Engineering I
5	Infrastructure Engineering

Course Objectives:

	To prepare the students to make estimate of building, road, and other civil engineering structures

Course Outcomes:

The student will be able to

1.	explain the specifications for different construction works and materials..
2.	prepare estimate of the buildings, and other civil engineering structures.
3.	.carryout rate analysis of different items of construction work
4.	Carry out valuation of civil engineering structures.

5.	fill the tender documents.
6.	compare different types of contracts

UNIT - I		**(6 Hours)**
	Estimating: Definition, importance of quantity surveying, types of estimates, data required for estimates, units of measurement & principles deciding the units, mode of measurement of building works. Abstracting, bill of quantities. Provisional & prime cost items, contingencies, establishment charges, centage charges, Schedule of rates (D. S. R.) **Approximate Estimate:** Definition, purpose, methods of approximate estimation of building & other civil engineering projects like roads, irrigation & water supply &sanitary engineering, electrical works.	
UNIT - II		**(6 Hours)**
	Methods of Taking out quantities: long wall, short wall method and centre line method of taking out quantities for different items of building. Estimate of RCC members. IS Codes used for estimating. **Specifications:** Definition & purpose, types, standard specifications. Drafting detailed specifications with reference to materials, quality, workmanship, method of execution, mode of measurement and payment, for major items such as earthwork, stone/brick masonry, plastering, ceramic tile flooring, R.C.C. work.	
UNIT - III		**(6 Hours)**
	Analysis of rates: Factors affecting cost of an item of work, materials, sundries, lab our, Tools & plant, overheads & profit. Task work - definition & factors affecting task work. Analysis of rates of any five items. **Estimate of Road:** Methods of estimate of earthwork for road, canal. Estimate of different types of roads.	
UNIT - IV		**(6 Hours)**

	Valuation of Properties: Purpose, nature of value, price, cost and value, types of value. Factors affecting value of property. Concept of free hold and lease hold property. Depreciation & methods of working out depreciation, sinking fund, Years purchase, out goings. Methods of Valuation of Building: Land & building basis, Rental basis, Reproduction & replacement cost basis. O_1 form.	
UNIT - V		**(6 Hours)**
	Tenders: Definition. Methods of inviting tenders, tender notice, Pre- qualifications of contractor, tender documents, preparation of tenders. Submission in 3 bid/ 2 bid or single bid system. Qualitative and quantitative evaluation of tenders, E tendering. Comparative statement, pre- bid conference, acceptance of tenders, various forms of BOT tenders, global tendering. (A mockup exercise of preparation, submission, opening of tender documents is suggested). PPP contracts.	
UNIT - VI		**(6 Hours)**
	Contracts: General idea, types of contracts viz: lump sum, item rate, cost plus, Conditions of contracts. FIDIC document, standard contract conditions published by MOS and PI, Law of contract. Definition, objective & essentials of valid contract. **Conditions of contract:** General and Specific conditions. Condition regarding EM, SD, time as an essence of contract. Important conditions regarding addition, alteration, extra items, testing of materials, defective work, subletting, powers delegated to Engineer incharge regarding the above aspect, defect liability period, retention money, interim payment or running account bills, advance payment, secured advance, final bill. Settlement of disputes viz. dispute resolving board, arbitration, concept of partnering. Indian Contract Act. Liquidated damages, termination of contract.	
Assignments		
1. Approximate estimate of different types of buildings		
2. To determine quantities of different items of building and preparation of specifications for construction materials (Any five)		

3. Rate analysis.
4. To carryout the valuation of existing building.
5. Mock up exercise of submission of tender.
6. Types of contracts.
Term Work:
1.Estimate of different structures using long wall short wall method and centre line method
2.Detailed estimate of a single storied R. C. C. framed building using D.S.R. rates
3.Working out quantities of steel reinforcement for a slab, a beam, column footing and preparing bar bending schedule.
4. a)Detailed estimate of roadwork . b) Assignment on road earthwork calculations.
5.Estimating quantities for any two of the following a) House drainage & water supply arrangement. b) Pipe culvert or slab culvert c) Septic tank.
6.Drafting detailed specifications of any five items .
7. Assignment on valuation of building. (O_1 form)
8.Preparation of draft tender notice.
9. Rate analysis for any five items.
Text Books:
1. Estimating and Costing By: Rangwala Published By: Charotar Publishing House, Anand
2.Estimating, Costing Specifications & valuation in Civil Engineering By: M.Chakraborty
Reference Books:
1.Estimating and Costing in Civil Engineering: Theory and Practice, By: B.N Dutta. Published By: S. Dutta & Company, Lucknow.
2.Civil Engineering Contracts & Estimates By: B.S.Patil Published, Orient Longman Ltd. Mumbai.
3.I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.
4. D.S.R: District Schedule of Rates

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

40: Geotechnical Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Termwork : 01
	Term Work & Oral : 50 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering Mathematics
2.	Engineering Mechanics
3.	Fluid Mechanics

Course Objectives:

	To make student capable to determine the properties of soil and use of soil as a construction material.

Course Outcomes:

The student will be able to

1.	determine weight - volume relation in soil as a three phase system
2.	determine index properties of soil.
3.	explain the compaction and consolidation process.
4.	calculate the geostatic stresses and coefficient of permeability.
5.	measure the shear strength of soil by various methods.
6.	calculate the active and passive earth pressure by various methods.

UNIT - I	**Introduction to soil mechanics**	**(6 Hours)**
	Soil, Soil formation, soil types its composition, soil structures, clay mineral, soil mechanics, history and development of soil mechanics, basic definitions, weight volume relations in soil as three phase system, soil classification systems – USCS, IS, HRB, Textural classification, Activity of clay, Sensitivity of clay, Thixotrophy of clay	
UNIT - II	**Index Properties of Soil**	**(6 Hours)**
	Index properties of soil – Water content, specific gravity, particle size distribution, Consistency limits, density, relative density	
UNIT - III	**Permeability and Seepage Analysis**	**(6 Hours)**
	Stresses within a soil, effective stress principle, stress point and stress path, Soil - water systems- capillarity, flow, Darcy's law, permeability, and tests for its determination, head gradient and potential, seepage pressure, Upward flow condition, 2 D flow, Laplace equation, flow net and applications	
UNIT - IV	**Compaction and Stress Distribution**	**(6 Hours)**
	Compaction: - Laboratory compaction tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Field compaction; compaction specifications and field control. Stresses in soil: Geostatic Stresses, stress distribution, Bossinsque's Theory for point load, Westergaard's theory	
UNIT - V	**Shear Strength**	**(6 Hours)**
	a) Introduction- Shear strength an Engineering Property. Mohr's stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strain behavior of sands and clays. b) Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests.	
UNIT - VI	**Earth Pressure Theories**	**(6 Hours)**

	a) Earth Pressure- Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill, b) Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's graphical method of determination of earth pressure.	

Term Work:

Term work shall consist of the following experiments (Any Ten)

1. Determination of water content by oven drying method
2. Determination of specific gravity of coarse and fine grained soil
3. Classification of soil by sieve analysis
4. Determination of consistency limits – Liquid, plastic and shrinkage limit
5. Determination of in situ density test – Core cutter and sand replacement method
6. Determination of coefficient of permeability by –
   a) Constant Head Method b) Falling Head Method
7. Determination of OMC and MDD by Standard Proctor Test and Modified Proctor Test
8. Determination of shear parameters by Direct Shear Test.
9. Determination of Unconfined Compression Strength of soil
10. Determination of shear parameters Triaxial Shear Test
11. Determination of shear parameters Vane Shear Test

Assignments:

1. Study of various relationships between weight and volume, numerical based on it and classification of soil.
2. Classification of soil based on the index properties of soil.
3. Study of permeability and numerical based on it.
4. Study of Proctor tests, different field compaction equipments.
5. Determination of shear strength, numerical problems based on it.
6. Numerical problems based on earth pressure.

Text Books:

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

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

3. K. R. Arora, " Soil Mechanics & Foundation Engineering,

4. Punmia B.C., "Soil Mechanics and Foundation Engineering" Laxmi Publications

5. C. Venkatramaiah, "Geotechnical Engineering", New Age International Publishers

6. Gulati, Manoj Dutta, "Geotechnical Engineering", Tata McGraw Hill Publications

Reference Books:

10. Terzaghi Karl, Ralph B. Pech, "Soil Mechanics in Engineering Practice", A Wiley International Edition.
11. Holtz, R.D. and Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall.
12. Lambe, T.W. and Whitman, R.V., "Soil Mechanics", John Wiley and Sons.
13. Couduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India.
14. Das, B.M., "Principles of Geotechnical Engineering", Thomson Asia.
15. Korner Robert M. " Construction and Geotechnical Engineering" Tata McGraw Hill Publications Company, New Delhi
16. Joseph E. Bowels, "Soil mechanics and Foundation Engineering", Tata McGraw Hill Publications Company, New Delhi

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 A: Elective-I: Financial Management

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory - 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Project Management
2.	Economics and Management
3.	Construction Techniques and machinery.

Course Objectives:

	Students are expected to prepare company's financial position for decision making.

Course Outcomes:

The student will be able to

1.	manage financial planning of a construction project.
2.	forecast financial requirement of a construction firm.
3.	analyze Time-Value of Money.
4.	determine working capital for construction Project.
5.	apply theories of capital structures.
6.	carry out risk analysis of budget.

UNIT - I	**Introduction to Financial Management**	**(6 Hours)**

	Scope and Functions of Financial Management, Role of Finance Manager, Organization of the Finance function, Financial Planning, Financial Statement Analysis	
UNIT - II	**Financial Planning**	**(6 Hours)**
	Introduction, Objectives and steps in Financial planning, Factors affecting financial planning, estimation of financial requirement of a construction firm, Capitalization, Sources of Financing	
UNIT - III	**Capital Budgeting**	**(6 Hours)**
	Time Value of money – Future value of a single cash flow, annuity, Present value of Single Cash flow, Present Value of Uneven Cash flow, Discounting and Non-discounting techniques – NPV, IRR, BCR and Payback period.	
UNIT - IV	**Working Capital Management**	**(6 Hours)**
	Importance and Objectives, factors affecting working Capital, Determination of Working Capital, Working capital financing policy	
UNIT - V	**Capital Structure**	**(6 Hours)**
	Introduction, Salient features of Capital Structure, Factors influencing capital structure, Theories of Capital structures – EBIT and MM approach, Financial Management in India	
UNIT - VI	**Risk Analysis in Capital Budgeting**	**(6 Hours)**
	Introduction, Types and Sources of Risk in Capital Budgeting, Risk Adjusted Discount Rate, Certainty Equivalent Approach, Probability Distribution Approach, Sensitivity Analysis, Simulation Analysis	

Assignments: (Any Six)

12.	Assignment on Financial Management.
13.	Assignment on Financial Planning.
14.	Assignment on Balance Sheet & Profit-Loss statement.
15.	Assignment on Cash flows.
16.	Assignment on NPV, BCR and IRR
17.	Assignment on working Capital Management with reference to case study.

18.	Assignment on EBIT approach.
19.	Assignment on MM approach.
20.	Assignment on sensitivity analysis.
21.	Assignment on simulation.
Text Books:	
11.	Financial Management, I.M. Pande, Vikas Publication
12.	Financial Management, C. Paramasivam & T. Subramaniam, New Age International (P) Limited, Publishers.
Reference Books:	
17.	Financial Management, An Introduction, Jim Mc Menamin, Taylor and Francis
18.	Financial Management, M.Y. Khan, P.K. Jain, Tata McGraw Hill Publication
19.	Financial Management, Prasanna Chandra, Tata McGraw Hill Publication

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II & III
Unit Test -2	UNIT – IV, V & VI

41 B: Elective-I - Advanced Structural Analysis

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Structural Analysis- I
2.	Structural Analysis- II

Course Objectives:

	The student should able to analyse the structure.

Course Outcomes:

The student will be able to

1.	calculate deflection of beams and frames using Castigliano's first theorem.
2.	analyze deflection of beams and frames using Castigliano's second theorem,
3.	analyze indeterminate beams using Stiffness matrix method.
4.	analyze indeterminate frames using Stiffness matrix method.
5.	analyze indeterminate beams using Flexibility matrix method.
6.	analyze indeterminate frames using Flexibility matrix method.

UNIT - I	**Deflection of Beams and Plane Frames using Strain Energy Method:**	**(06 Hours)**

	Deflection of determinate beams and rectangular portals by application of Castigliano's first theorem;	
UNIT - II	**Analysis of Beams and Plane Frames using Strain Energy Method:**	**(06 Hours)**
	Analysis of indeterminate beams and rectangular portals by application of Castigliano's second theorem with indeterminacy up to two degrees;	
UNIT - III	**Analysis of Beams using Stiffness Matrix Method:**	**(06 Hours)**
	Stiffness matrix method of analysis, Formulation of stiffness matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
UNIT - IV	**Analysis of Plane Frames using Stiffness Matrix Method:**	**(06 Hours)**
	Formulation of stiffness matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	
UNIT - V	**Analysis of Beams using Flexibility Matrix Method:**	**(06 Hours)**
	Flexibility matrix method of analysis, Formulation of flexibility matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
UNIT - VI	**Analysis of Plane Frames using Flexibility Matrix Method:**	**(06 Hours)**
	Formulation of flexibility matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	

Assignments:

1) Calculate deflection of beams using Castigliano's first theorem
2) Analyse indeterminate beams or rectangular portals by application of Castigliano's second theorem
3) Calculate stiffness matrix for beams
4) Calculate stiffness matrix for frames
5) Calculate flexibility matrix for beams
6) Calculate flexibility matrix for frames

Reference Books:	
1) Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication	
2) Pandit G. S. & Gupta S. P., “Matrix Methods of Structural Analysis”, Tata McGraw Hill Publication	
3) Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co.	
4) Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.	
5) Wilbur & Norris, “Basic Structural Analysis” Tata McGraw Hill Publication	
6) Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill Publication	
7) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
8) Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company	
9) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
10) Junnarkar S. B. & Adavi, “Mechanic of Structures”, Charotar Publishing House	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 C: ELECTIVE I: URBAN WATER MANAGEMENT

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination : 60 Marks	Theory :03
	Continuous Assessment : 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Physics, Chemistry, Mathematics and Statistics
2.	Ecology, Hydrology, Environment and Climate Change
3.	Water Engineering and Management

Course Objectives:

To learn Urban Water Management (UWM) which promises a better approach than the current system, in which water supply, sanitation, storm water and wastewater are managed by isolated entities, and all four are separated from land-use planning and economic development and adopt UWM and its adaptive, iterative processes will help cities significantly reduce the number of people without access to water and sanitation by providing water services of appropriate quantity and quality, thereby improving the health and productivity of urban residents.

Course Outcomes:

The student will be able to

1.	Understand how cities are growing and changing which is leading to describing the promise of IUWM and how some city case studies that explore the ways in which aspects of IUWM have been put into practice, since every city faces a different challenge and requires context-appropriate solutions.
2.	Focus on the implications of these changes for urban water resources: in the past, water security efforts focused on water quantity and understand how new concerns about water quality are now emerging.

3.	Understand and design the new tools and strategies to shift from urban water management to IUWM, and develop flexible and adaptable urban water systems.	
4.	Gain insight that how UWM can contribute to cities' resilience in the face of climate change and analyze changing climate demanding water management be approached in a different way.	
5.	Understand, apply and develop an enabling environment for the change toward a framework for integrated urban water management.	
6.	Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities that are inclusive, productive, well governed, and sustainable which leads to foster a new culture of urban water management.	
UNIT - I	**Introduction to Urban Water Management**	**(6 Hours)**
	Introduction to Urban Water Management (UWM): Concept, Need, The changing urban context, Expanding city limits, Consequences of globalization and Urbanization, Urban-Rural Conflicts, Special challenges for some cities	
UNIT - II	**Water resources and urbanization**	**(6 Hours)**
	Water: Sources, Quantity and Quality, Wastewater: Sources, Quality and Reuse , Effects on Water Demand due to Urbanization, Water Cess Act, Water(Prevention and Control) Act 1974	
UNIT - III	**UWM tools and management strategies**	**(6 Hours)**
	Storm water management, Water reclamation and reuse, Water audits and efficient use, Flexible and adaptable urban water systems, Tariffs, payments and other economic tools, Benefit Cost Ratio for Urban Water Management	
UNIT - IV	**Climate Change Challenge**	**(6 Hours)**
	Climate Change: Introduction, Cause and Consequences, Climatic Variations in India in recent years, Effect of Climate change on Water Resources and Sanitation, Urban contributions to climate change, Response options , Resilience to climate change	
UNIT - V	**Conventional and Integrated Urban Water Management**	**(6 Hours)**
	Conventional Urban Water Management: Introduction, Present Scenario, Advantages and Disadvantages, Integrated Urban Water Management (IUWM): Introduction, Need, Advantages, Urban water governance, Application of IUWM for SMART CITY	

UNIT - VI	**Framework for integrated urban water management**	**(6 Hours)**
	Role of Central and Local governments, Involvement of Private sector, Business opportunities and Employment Enhancement, Participation of NGO's and Stakeholder, Sustainable Development and Practices	

Assignments:

1. Collection of data how cities are growing and changing describing the promise of IUWM
2. Study of urban water resources: in the past and how new concerns about water quality are now emerging.
3. Design new tools and strategies to shift from Conventional urban water management to IUWM
4. Study and data collection of climate change and analyze changing climate demanding water management be approached in a different way.
5. Design framework for integrated urban water management for Existing and Futuristic SMART Cities
6. Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities to foster a new culture of urban water management.
7. Field Visit and Report on SMART City and/orTownship in India and/or abroad

Text Books:

1. Urban Water Engineering and Management by Mohammad Karamouz, Ali Moridi, Sara Nazif, January 20, 2010 by CRC Press Textbook, ISBN 9781439813102 - CAT# K10665
2. Municipal Stormwater Management, Second Edition by Thomas N. Debo, Andrew Reese, November 25, 2002 by CRC Press, Reference – 1176, ISBN 9781566705844 - CAT# L1584
3. Urban Storm Water Management by Hormoz Pazwash, April 28, 2011 by CRC Press, Reference – 550, ISBN 9781439810354 - CAT# K10518
4. Integrated Urban Water Management: Humid Tropics: UNESCO-IHP by Jonathan N. Parkinson, Joel Avruch Goldenfum, Carlos Tucci, March 26, 2010 by CRC Press, Reference – 180, ISBN 9780415453523 - CAT# K10165, Series: Urban Water Series
5. Water in Central Asia: Past, Present, Future by Victor A. Dukhovny, Joop de Schutter, January 25, 2011 by CRC Press, Reference – 432, ISBN 9780415459624 - CAT# K00021
6. The Economics of Sustainable Urban Water Management: the Case of Beijing: UNESCO-IHE PhD Thesis by Xiao Liang, September 28, 2011 by CRC Press, Reference – 200, ISBN 9780415691734 - CAT# K13927
7. Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations by Holger Treidel, Jose Luis Martin-Bordes, Jason J. Gurdak, December 2, 2011 by CRC Press, Reference – 414, ISBN 9780415689366 - CAT# K13833, Series: IAH - International Contributions to Hydrogeology
8. Metropolitan Sustainability: Understanding and Improving the Urban Environment Edited by F Zeman, Royal Military College of Canada, Canada, September 2012, Woodhead Publishing, ISBN: 978-0-85709-046-1
9. Designing the Urban Future: Smart Cities Kindle Edition by Scientific American Editors, Kindle Edition, Kindle eBook, 31 Mar 2014

10. Urban Water Supply and Sanitation in Southeast Asia: A Guide to Good Practice by Arthur C. McIntosh, ASIAN DEVELOPMENT BANK, ISBN 978-92-9254-554-3 (Print), 978-92-9254-555-0 (PDF), Publication Stock No. TIM135915-2
11. Water Resources and Economics In association with International Water Association (IWA), Editor-in-Chief: Prof. Dr. Roy Brouwer, ISSN: 2212-4284, ELSEVEIR
12. Water and Cities: Ensuring Sustainable Futures, Apr 2015, ISBN : 9789264230149 (PDF) ; 9789264230101 (print)
13. Water Management: Performance and Challenges in OECD Countries, Mar 1998, ISBN : 9789264162600 (PDF) ; 9789264160781 (print)
14. Good Practices in Urban Water Management: Decoding Good Practices for a Successful Future Edited by Anand Chiplunkar, Kallidaikurichi Seetharam,Cheon Kheong Tan, 2012, Asian Development Bank, National University of Singapore, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF), Publication Stock No. BKK102333
15. Strategic Planning of Sustainable Urban Water Management, P-A Malmqvist, G Heinicke, E Korrman, TA Stenstrom, G Svensson, 2006, IWA Publishing, ISBN13: 9781843391050, eISBN: 9781780402413, Categories: Utility / network management, Urban water
17. Climate Change and Water: International Perspectives on Mitigation and Adaptation edited by Carol Howe, Joel B. Smith, MS. Jim Henderson, American Water Works Association and IWA Publishing, ISBN: 978-1-58321-730-6
18. Climate Change and Water Resources by Younos, Tamim, Grady, Caitlin A (Eds.) , ISBN 978-3-642-37586-6, Springer, USA
19. Climate Change, Water Supply and Sanitation: Risk Assessment, Management, Mitigation and Reduction by Adriana Hulsmann, Gesche Grützmacher, Gerard van den Berg, Wolfgang Rauch, Anders Lynggaard Jensen, Victor Popovych, Mario Rosario, Lydia S. Vamvakeridou-Lyroudia, Dragan A. Savic, 2015, ISBN13: 9781780404998, eISBN: 9781780405001, Categories: Developing Countries, Water resources / environment, Water supply & treatment

Reference Books:

1. Integrated Urban Water Management By Akiça Bahri, Global Water Partnership Technical Committee (TEC), TEC BACKGROUND PAPERS, NO. 16, ISBN: 978-91-85321-87-2

2. Good Practices in urban water management: Decoding good practices for a successful future edited by Chiplunkar, Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan, Mandaluyong City, Philippines: Asian Development Bank, 2012, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF)

3. Integrated Urban Water Management for Planners By John Y. Whitler and Jennifer Warner, Water Research Foundation, PAS Memo — September/October 2014, American Planning Association, 205 N. Michigan Ave., Ste. 1200, Chicago, IL 6060

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III

Unit Test -2	UNIT – IV, V, VI

41 D: Elective-I: Docks, Ports and Harbours

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Fluid Mechanics
2.	Advanced Surveying (Hydrographic Survey)

Course Objectives:

	To study different marine structures and their design considerations.

Course Outcomes:

The student will be able to

1.	describe development of port.	
2.	describe the wave, tide and the phenomenon related to the same.	
3.	explain different harbour and port facilities.	
4.	design the breakwaters.	
5.	explain the port planning.	
6.	explain marine pollution.	
UNIT - I	**Introduction to Ports and Harbours**	**(6 Hours)**

	History, development of port and ship construction technology along with International trade, Port Development – Indian Scenario	
UNIT - II	**Waves and Tides**	**(6 Hours)**
	Concept of generation, propagation and form of wave in coastal zone, global tide phenomenon, types of tides concept of wave tranquility, resonance, coastal sediment transport	
UNIT - III	**Ports and Harbours**	**(6 Hours)**
	Harbour : classification, facilities and structures, Approcah channel, Marker Buoys, Breakwater layout, Berth and Jetties, Bulk oil container Ports: Loading unloading, storage, Customs and relevant facilities, security, hospital colony, Associated Services, Maintenance facilities, Dry docks, Slipway, locks.	
UNIT - IV	**Marine Structures**	**(6 Hours)**
	General design aspects, breakwaters - function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories- function, types, suitability, design and construction features.	
UNIT - V	**Port Planning**	**(6 Hours)**
	Modernization of port, Lifting and loading unloading (RORO) facilities, Computerization, Automation, berth occupancy, Port Cost Analysis, Dredging and disposal technology	
UNIT - VI	**Port Development**	**(6 Hours)**
	Role of port development and national policy, Public and private sector, Marine pollution and environmental aspects.	

Assignments:

1. Explain history and development of port in India.
2. Write the concept of wave generation and propagation in coastal zone
3. Explain the facilities provided at ports and harbours.

4. Design a breakwater with the data given.
5. Write different aspect of port planning.
6. National policy for port development and environmental aspect of it.
7. Site visit to CW & PRS
Text Books:
1. Basic Coastal Engineering, R.M.Sorenson, J.Wiley & Sons, 1978
2. Docks and Harbour Engineering,H.P.Oza and G.H.Oza, Charotar Publishing 2013
3. A Course in Docks and Horbour Engineering, S.P.Bindra, Dhanpatrai Publications
4. Harbour, Dock and Tunnel Engineering,R.Shrinivasan, Charotar Publishing House Pvt.Ltd (2013)
Reference Books:
1.Oceanographical Engineering, R.L.Wiegel, Prentice –Hall 1964
2.Coastal Engineering, Vols. 1 and 2 , R. Silvester Elsevier Scientific Publishing Co., 1974
3.N I O Design Manual

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 E: Elective-I: HUMAN RESOURCE MANAGEMENT

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering Economics Management
2.	Project Management

Course Objectives:

	To develop the skill of human resource management in construction industry.

Course Outcomes:

The student will be able to

1.	discuss the significance of human resources in construction industry.
2.	plan human resources.
3.	describe the recruitment and selection process.
4.	discuss the significance of training and development of employees.
5.	analyze the employee benefits and incentives.
6.	describe employee management relations.

UNIT - I	**Introduction**	**(6 Hours)**
	History of HRD, Objectives, Functions, HRD in Construction industry, status of construction labour.	
UNIT - II	**Human Resource Planning**	**(6 Hours)**

	Formulating human resource plans, various methods, job analysis, job specifications and job design in construction projects, forecasting personal needs and supply in construction sector.	
UNIT - III	**Recruitment & selection**	**(6 Hours)**
	Selecting project manager & project team, external & internal recruitment. Data gathering methods, skill requirement of construction personnel.	
UNIT - IV	**Training & Development**	**(6 Hours)**
	The training Process, Individual and organizational development, change management, performance appraisal, use of performance appraisal information establishing the evaluation system, Performance Management / Encouragement, Rewarding Employees	
UNIT - V	**Employee Benefits**	**(6 Hours)**
	Employee health and safety, wage and salary administration, incentive system, wages of construction industry, retirement and pensions.	
UNIT - VI	**Employee Management Relations**	**(6 Hours)**
	Collective Bargaining, Effective ways of working, trade unions act, labour welfare act, payment of wages act ,workers compensation act ,contract labour act, management of conflicts.	

Assignments:

1. Case study of HRD in construction industry
2. Formulating human resource plan
3. Case study of external and internal recruitment
4. Report on establishing evaluation system for performance appraisal
5. Importance on Employee benefits
6. Report on conversation with HR of any construction industry

Text Books:

13. "Human Resource Development and Management" by "Biswanath Ghosh", Vikas Publishing House Pvt. Ltd.

14. "Human Resource Management" by "S.C. Agarwal", Dhanpat Rai Publications

15. Personnel & Human resource Management – C.B. Mamoria, Himalaya Publishing House

Reference Books:

20.	Human resource management – Subbarao, Himalaya Publishing House
21.	Human Resource Management— K. Aswathappa, TMH Pvt. Ltd
22.	“Human Resource Management” by “John Stredwick”
23.	International Human Resource Management--- Gary Diesler

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 F: Elective-I - Green Construction Practices.

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have

	basic knowledge of conventional construction practices, green materials and immerging trends in the green building industry.

Course Objectives:

1.	To understand the concept of sustainability and sustainable development
2.	To familiarize students with various environmental issues
3.	To familiarize students with various Green Building Rating Systems
4.	To understand selection criteria and implementation options for various green material
5.	To inform the various alternatives materials and construction practices.
6.	To inform the various recycled and innovative materials and construction techniques through case studies.

Course Outcomes:

The student will be able to

1.	evaluate the immerging trends in the fields of sustainable development and environment.
2.	evaluate the effects of construction industry on environment.
3.	understand the various evaluation systems for green buildings.

4.	implement various green material selection and construction techniques.	
5.	determine immerging trends in alternative materials and construction techniques.	
6.	determine immerging trends in the field of recycled and innovative materials	
UNIT - I	**Introduction to Sustainable Development**	**(06 Hours)**
	Basic Concepts of Sustainable Development - History of sustainable development in India and around the world – Sustainable Development an overview Bruntland Commission, UNFCCC – Goals of sustainable development – Energy, Environment and Financial sustainability.	
UNIT - II	**Environment Management and Impact Assessment**	**(06 Hours)**
	Environment Management Basic: Introduction to biodiversity, Ecosystem and impacts of climate change on environment Environment Laws and Policies: EP Act (Environment Protection Act) Acts related to pollution and climate change	
UNIT - III	**Sustainable Architecture and Green Buildings**	**(06 Hours)**
	Green Ratings System: in India and around the world- an introduction Green Rating Systems in India : LEED (IGBC), Griha – Ecohousing,	
UNIT - IV	**Green Building Materials and Construction Techniques**	**(06 Hours)**
	Introduction to Green materials – Life Cycle Analysis – Life Cycle Cost Analysis – Selection criteria of Materials and Construction Techniques Green Buildings.	
UNIT - V	**Alternative Material and Construction Techniques:**	**(06 Hours)**
	Bamboo, ferrocrete, cob-adobe, etc and their construction techniques.	
UNIT - VI	**Recycled and Innovative Materials and Construction Techniques**	**(06 Hours)**
	Recycled glass, plastic, recycled debris block. Process of manufacture and construction.	
Assignments:		

22.	Assignment on various building practices carried out conventionally and the consequences.
23.	Assignment on Eco system and food chain,
24.	Assignment on Environmental Impact.
25.	Report writing on Green Material.
26.	Report writing on Indoor Environmental Quality Enhancement facilities.
27.	Case Studies

Text Books:	
16.	Dominique Gauzin – Muller "Sustainable Architecture and Urbanism: Concepts,
17.	Slessor, Eco-Tech : "Sustainable Architecture and High Technology", Thames and Hudson
18.	Ken Yeang, "Ecodesign : A manual for Ecological Design", Wiley Academy, 2006.

Reference Books:	
1.	Francis D.K. Ching, Ian M. Shapiro : "Green building Illustrated"
2.	**Kumar**, Surender, **Managi**, Shunsuke: "The Economics of Sustainable Development The Case of India "

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 G: Elective-I*:* Numerical Methods in Civil Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering Mathematics
2.	Concept of differentiation and integration
3.	Partial differential equations.

Course Objectives:

	To give a broad background to numerical methods common to various branches of civil engineering to the student.

Course Outcomes:

The student will be able to

1.	find out core concepts of error estimate and accuracy of numerical solutions.
2.	use direct solutions of linear systems.
3.	use iterative solutions of linear systems.
4.	use direct solutions of non-linear systems.
5.	use numerical solutions to solve partial differential equations.
6.	use numerical integration methods to solve partial differential equations.

UNIT - I	**Introduction to Numerical Methods.**	**(6 Hours)**

	Introduction, need of studying numerical methods, Sources of error in numerical solutions: truncation error, round off error. Order of accuracy - Taylor series expansion.	
UNIT - II	**Direct Solutions of Linear Systems**	**(6 Hours)**
	Gauss elimination, Gauss Jordan elimination. Pivoting, inaccuracies due to pivoting. Factorization, Cholesky decomposition.	
UNIT - III	**Iterative Solutions of Linear Systems**	**(6 Hours)**
	Jacobi iteration. Gauss Seidel iteration. Convergence criteria.	
UNIT - IV	**Direct Solutions of Nonlinear Systems**	**(6 Hours)**
	Newton Raphson iterations to find roots of a 1D nonlinear equation. Generalization to multiple dimensions. Newton Iterations, Quasi Newton iterations. Local and global minimum, rates of convergence, convergence criteria.	
UNIT - V	**Numerical Methods to solve partial differential equations.**	**(6 Hours)**
	Difference operators (forward, backward and central difference), Stability and accuracy of solutions, Application of finite difference operators to solve initial and boundary value problems. Numerical quadrature: Trapezoidal rule, simpsons rule, Gauss quadrature**.**	
UNIT-VI	**Numerical integration of time dependent partial differential equations**	**(6Hours)**
	Parabolic equations: algorithms - stability, consistency and convergence, Lax equivalence theorem. Hyperbolic equations: algorithms - Newmark's method, stability and accuracy, convergence, multi-step methods.	

Assignments: Any Six

1. Assignment problem based on ‘Gauss -Jordan Method’.
2. Assignment problem based on ‘Gauss -Elimination Method’.
3. Assignment problem based on ‘Gauss –Seidel Iteration Method’.
4. Assignment problem based on ‘Newton-Raphson Method’-1D solution.
5. Assignment problem based on ‘Newton –Raphson Method’-multidimensional solution.
6. Solution of Partial Differential Equation using ‘Trapezoidal Rule’.

7. Solution of Partial Differential Equation using ‘Simposon’s Rule’.

8. Solution of Partial Differential Equation using ‘Gauss Quadrature Rule’.

9. Solution of Time Dependent Partial Differential Equation .

Text Books:

1. Balaguruswamy “ Numerical Methods” Tata Mcgraw Hill Publications
2. Dr.V.M.Domkundwar “Numerical Methods”
3. S. S. Sastry “Introductory Methods of Numerical Analysis”, Prentice Hall India

Reference Books:

1.T.J.R.Hughes"The Finite Element Method", Prentice Hall, Englewood Cliffs, NJ, 1987.

2. I.Stakgold , “Green's functions and Boundary Value Problems", Wiley, 1998.

3.D.Dahlquist and A. Bork "Numerical Methods", Dan Prentice-Hall, Englewood Cliffs, NJ,. 1974.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

ENGINEERING MATHEMATICS-IV (OPTIONAL SUBJECT)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Determinants
2.	Matrices
3.	Differentiation
4.	Integration of functions
5.	Differential equation
Course Objectives:	
	The course aims at making the students familiar about the most basic numerical methods and concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.
Course Outcomes:	
The student should be able to	
1.	derive appropriate numerical methods to solve algebraic and transcendental equations
2.	evaluate the accuracy of common numerical methods.

3.	develop appropriate numerical methods to solve a difference equation
4.	be familiar with numerical interpolation and approximation of functions , numerical integration and differentiation.
5.	be familiar with numerical solution of ordinary differential equations.
6.	To compute Numerical Solution of Partial Differential Equations.

UNIT - I	**Numerical solutions of algebraic and transcendental equations**	**(08 Hours)**
	Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.	
UNIT - II	**Solution of system of linear algebraic equation**	**(08 Hours)**
	Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.	
UNIT - III	**Difference equation and Solution of difference equations**	**(08 Hours)**
	Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.	
UNIT - IV	**Interpolation and Numerical differentiation and integration**	**(08 Hours)**
	Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting : Method of least squares. Straight line, Second degree, parabola, Exponential curve.	

	Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.	
UNIT - V	**Numerical solution of I order ordinary differential equation**	**(08 Hours)**
	solution by Euler's,method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.	
UNIT - VI	**Numerical Solution of Partial Differential Equations**	**(08 Hours)**
	Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.	

Text Books:

1. Gupta P.P.& Malik G.S., *Calculus of Finite Differences and Numerical Analysis*, Krishna Prakashan Mandir,Meerut, 21/e, 2006.

2. B.S.Grewal, *Engineering Mathematics*, Khanna Publishers, 12/e, 2006.

Reference Books:

24. Francis J. Scheid, Schaum's *Outline of Numerical Analysis*, McGraw-Hill, New York, 1989.

25. S. S. Sastry, *Engineering Mathematics*, Vol I, II Prentice Hall Publication, 3/e, 2004.

26. C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co Ltd., 6/e,2003.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

42 Professional Skills Development VI

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTED:**
Theory: 4 Hours / Week	End Semester Examination: 100 Marks	4

Course Pre-requisites

The Students should have knowledge of

1.	Concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2.	A basic knowledge of Group Discussion, DO's and Don'ts done in the previous sem.
3.	Basic knowledge of writing skills, importance of professionalism in emails and letters.
4.	Knowledge on the concepts of criticism, feedback and conflicts.
5.	Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6.	Brief idea about professional and business meeting etiquettes.

Course Objectives

The Professional Skills Development 6 is an extension of PSD- 5 with focus on the remaining topics of Aptitude and Grammar. The further complex concepts of Permutation and Combination, Probability and grammatical topics such as prepositions etc would be dealt with. The objective here is to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-6 focuses on the other important aspects of soft skills training students such as techniques of effectively handling Personal Interviews during placement process and understand the dynamics of structured Resume and PIs

Course Outcomes

The student should be able to

1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics such as prepositions, conjunctions etc relevant from the recruitment point of view.	
2.	Learn to handle vocabulary questions such as synonyms and analogies in recruitment test and other competitive exams	
3.	Understand and Learn techniques/Strategies of how to handle Personal interviews during recruitment process. Through Mock PIs students would be taught the appropriate ways of answering tricky questions in Interview and would learn the correct body language etc to be demonstrated in an interview process.	
4.	They would be acquainted with the differences between CV, Bio- Data and Resume and they would learn the correct format of a Résumé along with methods and styles to make their Resumes interesting.	
5.	Students would learn to incorporate various rules of written communication in business writing scenario with the appropriate tone and words.	
6.	Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector.	
Unit I	**Aptitude (Maths, Logical Reasoning, English)**	**(24Hours)**
	• Maths ▪ Permutation & Combinatiom ▪ Probability ▪ Maths Revision -1 ▪ Maths Revision - 2 • Logical Reasoning ▪ Matching, Selection & Arrangement ▪ Clocks & Calendars, Visual Reasoning ▪ Input , Output & Flow Chart. ▪ Reasoning Revision- 1 ▪ Reasoning Revision-2 • English ▪ Grammar – III– (Prepositions& Conjunctions) ▪ Grammar- (Articles & Parallelism) ▪ Verbal Ability Revision- I	
Unit II	**Soft Skills & English Communication**	**(24Hours)**

	• Resume-I • Resume- II • Mock GD • Mock GD • Personal Interviews-I • Personal Interviews-II • Mock PI • Mock PI • Extempore Speeches, Group Interviews • Written Skills- Revision • Stress Management • Business Writing Tones.	
Text Books		
1. APAART: Verbal Ability		
2. APAART: Logical Reasoning		
3. APAART: Quantitative Aptitude		
4. APAART: Speak Well 1 (English Language and Communication)		
5. APAART: Speak Well 2 (Soft Skills)		

Programme: B. Tech. (Civil) – Sem I - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment			TW	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments					
1.	Engineering Mathematics- I	3	--	1	60	20	10	10	--	100	4	-	4
2.	Fundamentals of Civil Engineering	3	2	--	60	20	10	10	25	125	3	1	4
3.	Engineering Graphics*	4	2	--	60	20	10	10	25	125	4	1	5
4.	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1	5
5.	Fundamentals of Electrical Engineering	3	2	--	60	20	10	10	25	125	3	1	4
6.	Professional Skill Development-I	2	--	--	50	--	--	--	--	50	2	-	2
7.	Computer Applications in Civil Engineering-I	-	2	--	--	---	--	--	50	50	-	1	1
	Total	**19**	**10**	**1**	**350**	**100**	**50**	**50**	**150**	**700**	**20**	**5**	**25**

*End Semester Exam of duration 4 hours.

Programme: B. Tech. (Civil) – Sem II - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW	Total	Theory	TW	Total
8.	Engineering Mathematics- II	3	--	1	60	20	10	10	--	100	4	-	4
9.	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1	4
10.	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1	5
11.	Engineering Chemistry	4	2	--	60	20	10	10	25	125	4	1	5
12.	Building Construction	3	2	--	60	20	10	10	25	125	3	1	4
13.	Professional Skill Development-II	2	--	--	50	--	--	--	--	50	2	-	2
14.	Workshop Technology	--	2	--	--	---	--	--	50	50	-	1	1
	Total	**19**	**10**	**1**	**350**	**100**	**50**	**50**	**150**	**700**	**20**	**5**	**25**

Total Credits

Semester I = 25

Semester II = 25

Grand Total = 50

Programme: B. Tech. (Civil) – Sem III - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW &Oral	TW& Practical	Total	Theory	TW	Total
15	Building Planning, Design and Byelaws*	3	2	--	60	20	10	10	50	--	150	3	1	4
16	Applied Geology	3	2	--	60	20	10	10	--	50	150	3	1	4
17	Engineering Economics & Financial Accounting	3	-	-	60	20	10	10	--	---	100	3	--	3
18	Mechanics of Solids	4	--	1	60	20	10	10	---	---	100	5	-	5
19	Concrete Technology	3	--	--	60	20	10	10	--	----	100	3	-	3
20	Professional Skill Development-III	4	--	--	100	---	----	--	--	----	100	4	-	4
21	Computer Applications in Civil Engineering-II	---	2	--	---	--	---	---	---	50	50	---	1	1
22	Testing of Materials	--	2	--	--	--	--	--	50	---	50	--	1	1
	Total	**20**	**08**	**01**	**400**	**100**	**50**	**50**	**100**	**100**	**800**	**21**	**4**	**25**

*End Semester Exam of duration 4 hours.

Programme: B. Tech. (Civil) – Sem IV - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW& Oral	TW&Practical	Total	Theory	TW	Total
23	Engineering Mathematics-III	3	--	1	60	20	10	10	--	---	100	4	-	4
24	Surveying	3	4	--	60	20	10	10	--	50	150	3	2	5
25	Mechanics of Fluids	3	2	--	60	20	10	10	50	----	150	3	1	4
26	Construction Techniques and Machinery	3	--	--	60	20	10	10	---	----	100	3	-	3
27	Structural Analysis- I	3	--	--	60	20	10	10	---		100	3	-	3
28	Professional Skill Development-IV	4	--	--	100	--	--	--	--	---	100	4	--	4
29	Computer Applications in Civil Engineering-III	---	2	--	---	--	---	---	---	50	50	---	1	1
30	Civil Engineering Construction Practice	--	2	--	--	--	--	--	50	----	50	--	1	1
	Total	**19**	**10**	**01**	**400**	**100**	**50**	**70**	**100**	**100**	**800**	**20**	**5**	**25**

Total Credits

Semester III = 25

Semester IV = 25

Grand Total = 50

Programme: B. Tech. (Civil) – Sem V - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW& Oral	TW& Practical	Total	Theory	TW	Total
31.	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32.	Advanced Surveying	3	2	--	60	20	10	10	50	--	150	3	1	4
33.	Engineering Project Management	3	2	--	60	20	10	10	50	---	150	3	1	4
34.	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35.	Advanced Mechanics of Fluid	3	2	--	60	20	10	10	50	----	150	3	1	4
36.	Professional Skill Development-V	4	--	--	100	--	--	--	--	---	100	4	--	4
	Total	**20**	**08**	**1**	**400**	**100**	**50**	**50**	**200**	**--**	**800**	**21**	**4**	**25**

*End Sem Exam of duration 4 hours.

Optional Subject

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

Programme: B. Tech. (Civil) – Sem VI - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW &Oral	TW& Practical	Total	Theory	TW	Total
37.	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38.	Environmental Engineering-I	3	2	--	60	20	10	10	--	50	150	3	1	4
39.	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40.	Geotechnical Engineering	3	2	--	60	20	10	10	50	---	150	3	1	4
41.	Elective-I	3	--	--	60	20	10	10	--	-----	100	3	--	3
42.	Professional Skill Development-VI	4	-	--	100	--	--	--	--	---	100	4	-	4
	Total	**19**	**08**	**2**	**400**	**100**	**50**	**50**	**150**	**50**	**800**	**21**	**4**	**25**
MD	Environmental Studies	**3**	**-**	**-**	**100**	**-**	**-**	**25**	**-**	**-**	**125**	**-**	**-**	**--**

*End Sem Exam of duration 4 hours.

Total Credits

Semester V = 25

Semester VI= 25 Grand Total = 50

Programme: B. Tech. (Civil) – Sem VII - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW& Oral	TW& Practical	Total	Theory	TW	Total
43	Structural Design-III*	3	2	-	60	20	10	10	50	--	150	3	1	4
44	Environmental Engineering-II	3	2	--	60	20	10	10	50	--	150	3	1	4
45	Foundation Engineering	3	-	--	60	20	10	10	--	---	100	3	-	3
46	Urban Planning	3	-	--	60	20	10	10	--	---	100	3	-	3
47	Elective-II	3	--	--	60	20	10	10	---	---	100	3	--	3
48	Computer Applications in Civil Engineering-IV	--	2	-	--	--	-	---	50	--	50	--	1	1
49	Project Stage- I	--	2	--	-	-	-	-	50	---	50	--	4	4
50	In plant Training for 45 days	--	--	--	--	--	--	--	50	---	50	--	3	3
	Total	**15**	**12**	**-**	**300**	**100**	**50**	**50**	**250**	**00**	**750**	**15**	**10**	**25**

*End Sem Exam of duration 4 hours.

Programme: B. Tech. (Civil) – Sem VIII - 2014 Course

Sr.No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW& Oral	TW& Practical	Total	Theory	TW	Total
51	Earthquake Resistant Design of Structures	3	2	--	60	20	10	10	50	--	150	3	1	4
52	Water Resources Engineering	3	2	1	60	20	10	10	--	50	150	4	1	5
53	Infrastructure Engineering	3	2	-	60	20	10	10	50	---	150	3	1	4
54	Elective-III	3	2	--	60	20	10	10	50	---	150	3	1	4
55	Project Stage- II	--	6	--	--	-	--	--	150	-----	150	--	8	8
	Total	**12**	**14**	**1**	**240**	**80**	**40**	**40**	**300**	**50**	**750**	**13**	**12**	**25**

Total Credits

Semester -VII = 25

Semester -VIII = 25 **Grand Total = 50** **Total Credits from Sem-I to Sem-VIII= 200**

Programme: B. Tech. (Civil)

Sr.No.	41 Elective –I (Sem VI)		Sr.No.	47 Elective II (Sem VII)
41 A	Financial Management		47A	Construction Management
41 B	Advanced Structural Analysis		47B	Maintenance & Rehabilitation of the Structures
41 C	Urban Water Management		47C	Environmental Impact Assessment
41 D	Docks, Ports and Harbours		47D	Bridge and Tunnel Engineering
41 E	Human Resource Management		47E	Ground Water Hydrology
41 F	Green Construction Practices		47F	Geo informatics
41 G	Numerical Methods in Civil Engineering		47G	Advances in Concrete technology & Composites
Sr.No.	**54 Elective-III (Sem VIII)**			
54A	Disaster Management			
54B	Advanced Steel Design			
54C	Solid Waste Management			
54D	Entrepreneurship Development			
54E	Hydraulic Structures			
54F	Social and Legal Aspects in Civil Engineering			
54G	Advanced Engineering Geology with Rock Mechanics			
54 H	Development Engineering			

43: Structural Design-III

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1.	conditions of equilibrium, plotting Shear force and bending moment diagram of beams with various support conditions and various load combinations.
2.	Determination of bending stress and shear stress in beams,Concept of short, long columns, direct and bending stress, principal stress and strains.
3.	Concrete, concreting techniques and properties of concrete
4.	Design a R.C.C. slabs, beams, columns and footings as per limit state method
5.	Concepts of Working Stress Method and design of singly reinforced beam by working stress method.

Course Objectives:

	The students should be able to design advanced structures in Reinforced Cement Concrete and in Prestressed Concrete.

Course Outcomes:

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

1.	differentiate between prestressed concrete and reinforced concrete, analyse a prestressed concrete beam, draw the stress distribution diagrams at initial and final stages of loading and know the various methods of prestressing.

2.	calculate various losses due to prestressing, design a simply supported prestressed concrete beam (rectangular , symmetrical and unsymmetrical flanged beam) for flexure ,shear and deflection.
3.	design and detailing of flat slab using I.S. code method
4.	design and detailing a T and L shaped cantilever retaining wall for various loading conditions.
5.	design and detailing of a rectangular combined footing for two columns, beam-slab type.
6.	design the circular water tanks resting on ground using I.S. code method, design of rectangular tanks using I.S. code method

UNIT - I	**Introduction to Prestressed Concrete Structures**	**(06Hours)**
	Introduction to prestressing, Basic definitions and terms related to pre stressing, Concepts of prestressing, Materials used, Various methods of prestressing, analysis of P.S.C. beam for flexure.	
UNIT - II	**Losses and Design of P.S.C.beam**	**(06Hours)**
	.Concept of losses, Calculation of various losses. Design of Pre stressed simply supported beams of rectangular and flanged cross sections , design for flexure and shear only , check for deflection, Design should confirm to the latest version of I.S. 1343	
UNIT - III	**Design of Flat Slabs**	**(06Hours)**

	Concept of flat slabs ,Design of flat slabs using latest I.S. Codes	
UNIT - IV	**Design of Retaining walls**	**(06Hours)**
	Design of cantilever retaining walls –T and L-shaped for all loads as per latest I.S. codes.	
UNIT - V	**Design of Combined Footing**	**(06Hours)**
	Design of slab type rectangular combined footing for two columns only. Concept of beam- slab type footing.	
UNIT - VI	**Design of Water Tanks**	**(06 Hours)**
	Design of containers only , resting on ground.Use of latest version of I.S. 3370 Circular tanks - using I.S. code method. Design of rectangular water tanks using I.S.Code method	

Assignments: Any six from the list given below.

1. Assignment problems based on analysis of rectangular P.S.C.beam
2. Assignment problems based on analysis of unsymmetrical I section of a P.S.C.beam
3. Assignment problems based on analysis of T section of a P.S.C.beam
4. Assignment problems based on time dependent losses in prestressing
5. Assignment problems based on instantaneous losses in prestressing
6. Assignment problems based on design of a rectangular prestressed concrete beam.
7. Assignment problems based on design of a flat slabs.
8. Assignment problems based on design of L-shaped retaining wall.
9. Assignment problems based on design of circular water tank using I.S.Code method.
10. Assignment problems based on design of rectangular water tank using I.S. Code method.

Term Work:	
1.	Termwork should be based on above syllabus.
2.	Termwork should consist of three projects on above syllabus.
3.	Minimum three half imperial sheets based on above projects to be drawn.
Text Books:	
1.	Dr. V. L. Shah and Dr. S. R. Karve- "Limit State Theory and Design", Pune VidyarthiGriha Publications
2.	Punmia, Jain and Jain, "Comprehensive Design of R. C. Structures", Standard Book House
3.	Sinha R.C."RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi
4.	Ramamrutham " Design of R. C. Structures '- Dhanpat Rai Publications
5.	Krishna raju " Advanced Design of Structures"
Reference Books:	
1.	T.Y.Lin " Design of P.S.C structures"
2.	. S. S. Bhavikatti, "Advanced R.C.C. Design", New Age International Ltd.
3.	.N.Subramanian" Design of Reinforced Concrete Structures" Oxford University Press
4.	S.Unnikrishnan Pillai,Devidas Menon "Reinforced Concrete Design"-Tata Mcgraw Hill Companies
5.	P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi
Syllabus for Unit Test:	

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

44: Environmental Engineering II		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Engineering Chemistry
2.	Engineering Mathematics
3.	Mechanics of fluids
Course Objectives:	
	To make student understand
1.	Hydraulic design of sewers and storm water.
2.	Principle and Design of Sewage Treatment Plant.
3.	The characteristics of wastewater (domestic as well as industrial).
4.	The effect of wastewater discharge (domestic as well as industrial) into the environment in uncontrolled fashion.
5.	The difference between requirement of rural area and urban area for water and waste water management.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Use the concept related to sewage, sewer, storm water etc in its hydraulic design
2.	Study and design of Primary treatment units.
3.	To test the sample of waste water in the laboratory for physical & chemical characteristics.

4.	Take-up functional planning, layout and design of sewage treatment plant components.	
5.	Analyze the industrial waste water for its treatment units	
6.	Plan for rural sanitation provisions, perform functional design of septic tank	
UNIT - I	**Collection and Conveyance of sewage**	**(06 Hours)**
	General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade)	
UNIT - II	**Characteristics and Primary Treatment of Sewage**	**(06 Hours)**
	Characteristics of sewage – Physical, Chemical, Biological. Introduction to unit operations and processes. Primary Treatment –Preliminary and Primary treatment- screen chamber, grit chamber, oil & grease removal, Primary settling tank.(including design of screen chamber, grit chamber, primary settling tank)	
UNIT - III	**Secondary Treatment of Sewage and disposal of sewage**	**(06 Hours)**
	Secondary Treatment-Activated sludge process: Theory and design of ASP, sludge volume index, sludge bulking & control, modifications in ASP. Trickling filter: Biological principle, different T.F. media & their characteristics, design of standard rate and high rate filters, single stage & two stage filters, recirculation, ventilation, operational problems, control measures. Introduction to the process of sequencing batch reactor(SBR) and membrane bioreactor (MBR). Disposal of sewage: Methods and effluent standards for disposal	
UNIT - IV	**Treatment and Anaerobic Digestion of Sludge**	**(06 Hours)**
	Principles of anaerobic digestion, stages of digestion, bio-gas production, its characteristics and application, factors governing anaerobic digestion, Design of high rate digester, Theory, Process and design of sludge drying bed. Advances in sludge treatment and disposal.	
UNIT - V	**Industrial Waste Water treatment**	**(06 Hours)**

	Industrial waste water treatment: Methods of sampling, Equalization and neutralization. Application of preliminary, primary and secondary treatment for industrial wastewater as per the CPCB norms. Sources of waste water generation from manufacturing process, characteristics of effluent, different methods of treatment & disposal of effluent for the following industries: Sugar, dairy and Pulp & Paper. Effluent Discharge standards as per CPCB norms. Introduction to concept of CETP (Common Effluent Treatment Plant.)	
UNIT - VI	**Rural Sanitation**	**(06 Hours)**
	Rural sanitation: Importance of Rural sanitation, bio-gas recovery. Septic tank including soak pit. Waste water recycling and reuse- Definition of terms used in water reuse applications, Role of water recycling in Hydrological Cycle, Waste water reuse application, need for water reuse, Public Health and Environmental issues in reuse of treated waste water, Two Pit Latrines.	

Assignments:

11. Numericals on Hydraulic Design of Sewer
12. Characteristics of sewage sample collected by the students.
13. Numericals on Design of standard rate and high rate filters
14. Collection of information - Advances in sludge treatment and disposal.
15. Drawing Layout of ETP of Sugar, Pulp and Paper, Dairy Industries (Case studies)
16. Numericals on Design and drawing of septic tank for hostel
17. Information of useful micro-organisms in waste water treatment
18. Case studies – Recycle and reuse of treated waste water.
19. Case studies - Rural sanitation. (Site Visit).

Term Work: First five experiments compulsory and any three from remaining six.

1. **Determination of** Solids -Total solids, suspended solids, volatile solids, settleable solids &nonsettleable solids, Total Dissolved solids, Fixed Solids.
2. **Determination of** Dissolved oxygen

3. **Determination of** Bio-Chemical Oxygen Demand
4. **Determination of** Chemical Oxygen Demand
5. **Determination of** Electrical Conductivity of waste water samples
6. **Determination of** Phosphates from waste water samples by spectrophotometer
7. **Determination of** Nitrates from waste water samples by spectrophotometer
8. **Determination of** heavy metals from waste water samples like Cr^{6+} or Zn or Ni or Cd
9. **Determination of** total nitrogen from waste water samples by Kjeldhal method
10. Visit to domestic / Industrial wastewater treatment plant & its detailed reports
11. Computer aided design of Sewage Treatment Plant (STP) OR Effluent Treatment Plant (ETP) of Sugar or Dairy Industry using suitable software (C programming or any other suitable software)
Note: -Term Work should include a detailed analysis of practicalinterpretation, significance and application of test results
Text Books:
1. Waste Water Treatment & Disposal – Metcalf & Eddy – TMH publication
2. Environmental Engg. – Peavy, Rowe – McGraw Hill Publication.
3. Environmental studies by Rajgopalan- Oxford University Press
4. Waste Water Engg. – B.C. Punmia& Ashok Jain – Arihant Publications
5. Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication
6. Industrial Waste Water Treatment- A. D. Patwardhan Publication – PHL Learning Private Limited.
7. Water Supply And Wastewater Engineering – B S N Raju- McGraw Hill Publication.
8. Waste Treatment Plants-C. A. Sastry Narosa Punlication
9 CPHEEO Manual on sewage treatment
Reference Books:
1. Environmental Engg. – Davis - McGraw Hill Publication
2. Water Supply & Waste Water Engg.- B.S.N. Raju – TMH publication

3. Resources i) http://nptel.iitm.ac.in/courses-contents/IIT Kanpur and IIT Madras. ii) http://cpcb.nic .in iii) http://moef.nic .in	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

45: Foundation Engineering		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	building construction
2.	geotechnical engineering
3.	engineering mechanics
Course Objectives:	
	Student can apply the knowledge to design different types of foundations.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	carryout soil exploration.
2.	find out bearing capacity of soil
3.	apply knowledge of consolidation to foundation design..
4.	design pile foundation
5.	analyze sheet pile foundation
6.	apply methods of soil stabilization.

UNIT - I	**Soil Exploration**	**(6 Hours)**
	Purpose and planning of exploration programme. Subsurface exploration, Trial pits, Methods of borings. Provisions as regards Number of bore holes and depth of boring and spacing as per IS. Geophysical method- Seismic reflection method and Electrical resistivity method. Coring of rocks, preparation of bore logs and core logs subsurface exploration	

	report. Disturbed and undisturbed samples. Types of samplers. Field testing-SPT, DCPT, and its correlation IS Code provisions.	
UNIT - II	**Bearing Capacity**	**(6 Hours)**
	Modes of shear failure. Terzaghi's bearing capacity analysis and Bearing capacity factors. Skempton method for Strip, Rectangular and Circular footings. Effect of water table and depth on bearing capacity. Bearing capacity of layered soil. Effect of eccentricity. Use of SPT blow count and I.S. provisions. Plate Load Test, Floating foundation. Foundations on rocks, various field and laboratory tests on rocks for deciding SBC.	
UNIT - III	**Elastic settlement and Consolidation**	**(6 Hours)**
	Pressure bulb, Contact pressure, Elastic settlement of bases (Elastic Mechanism and Janbu's Method). I.S. criteria, Total and Differential settlement, Tolerable settlement, Allowable soil pressure. Effect of lowering of water table Consolidation Settlement: Introduction, Spring analogy, Terzaghi's consolidation theory, Laboratory consolidation test, Determination of coefficient of consolidation by Square root of time fitting method and Logarithm of time fitting method. Time factor, Rate of settlement and its applications in shallow foundation. Normal consolidation, over consolidation and preconsolidationpressure.	
UNIT - IV	**Pile Foundation**	**(6 Hours)**
	Introduction, Pile classification, Pile installation-Cast in situ, Driven pile. Load carrying capacity of pile by static method, Dynamic methodsEngineering News formula, Modified ENR formula. Pile load test and Cyclic and dynamic pile load test. Group action-Feld rule, Rigid block method. Negative skin friction. Settlement of pile group in cohesive soil by approximate method. Micro piles. Socketing of piles in rocks	
UNIT - V	**Sheet Piles and foundation on black cotton Soil .**	**(6 Hours)**

	Sheet Piles Strutting for excavations, Pressure distribution diagram. Cantilever sheet pile, Anchored sheet pile. Free earth support and Fixed earth support. Foundations on Black Cotton Soil.: Characteristics of black Cotton Soils, Problems and preventive measures Swelling potential, Under reamed piles – Design Principles and Techniques (Maximum two bulbs).Prefabricated vertical drains and Preloading Technique.	
UNIT - VI	**Geosynthetics and Soil Stabilization.**	**(6 Hours)**
	Geosynthetics -Types, Properties, Functions, Reinforcement concept. Reinforced soil structures with vertical faces, Reinforced soil embankments, Methods of soil stabilization. stone columns, compaction piles.	

Assignments:
1.A case study for Preparation of bore hole investigation report
2. Numericals on Bearing Capacity by different Methods.
3. Numericals on Plate load test.
4. Numericals on Consolidation of soil.
5 . Numericals on Elastic settlement by different methods.
6.Explain Pile load test.
7.Discuss Group action of piles and Negative skin friction.
8.Draw sketches of .Under reamed pile .
9. Sheet pile and its applications.
9. Methods of soil stabilization.
Text Books:
1.C.Venkatramaia, “Geotechnical Engineering”, New Age International Publication.

2.B.C.Punmia. “Soil mechanics and foundation Engineering”, Standard Publishers and distributers.
3K.R.Arora, “Soil mechanics and foundation Engineering”, Standard Publishers and distributers.
Reference Books:
1.Braja M.Das.“Foundation Engineering”. Centage Learning India Pvt. Ltd.
2.B. N.D.Narsinga Rao. Soil mechanics and foundation Engineering” ,Wiley India Pvt Ltd.
3.Tomlinson, “Foundation Engineering ”,Longman Book Ltd. Harlow
4.Joseph E. Bowels, “Foundation Engineering”,Mc.Graw Hill International
5.Donald P. Coduto “Foundation Design Principles and Practices”,Pearson Publication.
6. Gopalrajan “Basic and Applied SoilMechanics”, New Age International Publication
7.Gulati and Manoj Datta “Geotechnical and Foundation Engineering”, Mc.Graw Hill International

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

46: Urban Planning		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: Credits 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Building Planning and Design
2.	Building Bye laws and Development control rules.
3.	Infrastructure Engineering.
Course Objectives:	
	Students will study concept & process of Urban Planning.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	understand rationale of Town planning
2.	learn theory of Urban planning
3.	understand concept of smart city planning.
4.	learn process of making development plan as per MRTP Act 1966
5.	know Intelligent Transport system.

6.	Describe spatial aspects of planning.	
UNIT - I	**Rationale of planning**	**(6 Hours)**
	Definitions and Rationales of Planning ; Goals and objectives of planning; Components of planning; Benefits of planning; Foundations of Planning; Sustainability and rationality in planning; Components of sustainable urban and regional development; various sources of planning knowledge, various forms of planning knowledge; Reasoning and its various forms in planning; Space, place and location	
UNIT - II	**Theory of Urban Planning**	**(6 Hours)**
	Scope, purpose and methods of Planning, the nature and purpose of Town and Country Planning at National, Regional and local levels. The physical planning process and the relation between surveys and plan. Land-use planning, determinants of Land Use and of spatial patterns of urban land uses, Various surveys for physical planning and techniques of Analysis realization of the plan. The parts of the town and their relationship, planning standards, site layout and development, zoning and density control.	
UNIT - III	**Various types of Plans**	**(6 Hours)**
	Development Plans and Development Regulations Definition of development plan; Types of development plans: master plan, city development plan, structure plan, district plan, action area plan, subject plan, town planning scheme, regional plan, sub-regional plan; Planning Advisory Group report and the URDPFI Guidelines; Provisions of MRTP Act 1966; Defining development and development control regulations, types of development control; Implications of violations of development control regulations;	

UNIT - IV	**Smart City Planning**	**(6 Hours)**
	Concept of Smart City; Urban renewal, retrofitting and redevelopment program. Economic growth model of a city. Capacity building in urban administration and urban planning. Smart city planning for solid waste management, rejuvenation of streams and rivers, affordable housing to poor ,housing and slum redevelopment, energy efficient and green buildings, Water supply and its management, Concept of intelligent transport network and green belts. E governance and citizen's participation.	
UNIT - V	**Traffic and Transportation**	**(6 Hours)**
	Concept of PCU and level of service, capacity of uninterrupted flow conditions, factors affecting; capacity and level of service; capacity of rural and urban roads, capacity at intersections. Traffic Volume Count, origin destination survey, speed and delay study, parking surveys, road network inventory, accident study - need, design of survey proforma, methods of conducting surveys, analysis and interpretation; Concept of transport facility design.	
UNIT - VI	**Spatial Aspects**	**(6 Hours)**
	Settlements–rural and urban settlements in their regional setting hinterlands. Towns and cities their geographical characteristics. Urban concentrations and growth characteristics factors, historical, administrative, location, economic, socio-economic consequences. The essential characteristics of city/town, importance of morphological aspects in town planning. Use of remote sensing and GIS in planning.	
Assignments:		
1. Report on UDPFI guidelines for urban planning		
2. Settlements and their physical forms during various dynasties upto 18th century and during colonization		

3. Study of various surveys for Urban planning.
4. Write a report on preparation of development plan of a City
5. Case studies on Urban planning from ITPI Journal.
6. Applications of Remote sensing and GIS in Urban planning
7. Land use Survey of a given area
8. Layout of neighborhood design
9. Traffic volume survey at a given intersection
Text Books:
L.R. Kadiyali, " Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2007
Annapurna Shaw ," Indian cities " Oxford India ,2012
B. Gallion, S. Eisner , "The Urban Pattern", Van Nostrand Reinhold Company,2003
ITPI, " City and Metropolitan Planning & Design" ITPI, New Delhi
Reference Books:
Peter Hall, "Urban and Regional Planning" Routledge, New York, 2002
Smart City Guidelines, Ministry of Urban Development, Govt. of India. 2015
NCRPB, "Regional Plan 2021, New Delhi, 2005

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 A: Construction Management		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Building Construction,
2.	Building planning design and byelaws.
3.	Engineering Project Management.
Course Objectives:	
	Student can apply the knowledge of Construction Management during execution of civil engineering structures.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Know role, duties and responsibilities of construction manager.
2.	Carryout economic comparison of project
3.	Apply knowledge of linear programming to civil engineering problems.
4.	Carryout feasibility analysis
5.	Apply different laws to construction industry
6.	Prepare site layout.

UNIT - I	**Title- Construction Sector**	**(6 Hours)**

	Nature, Characteristics, Size and Structure of construction sector in India. Role in economic development of Nation ,Employment Generation, Infrastructure Development, CIDC's role in Gearing up Construction sector. Features of construction economy. Construction Management Role , importance ,,necessity , characteristics and functions of construction management Role ,Qualities, Ethics, Duties, Authorities, Responsibilities and Training of Construction Managers'	
UNIT - II	**Title-Engineering Economics**	**(6 Hours)**
	a) Time value of money, Cash flow diagram. Meaning and necessity of Economics, types of costs, interest- simple, compound, b) Economic comparisons of projects- Discounting Methods net present worth method, benefit cost ratio method, internal rate of return method.	
UNIT - III	**Linear Programming**	**(6 Hours)**
	Transportation and Assignment Models, Game theory, Pure and Mixed strategy.	
UNIT - IV	**Artificial Intelligence in Construction Management**	**(6 Hours)**
	Introduction to Artificial Neural Network, Fuzzy logic and Building information modeling	
UNIT - V	**Construction Labour and Legislation**	**(6 Hours)**
	Necessity and importance of labour laws, Law of Contract, Contract labour Act, 1970,Worksman compensation Act 1923, Child labour Act, Building and construction Act, Employees Provident fund Act , Payment of wages Act, Minimum wages Act. Industrial Disputes Act	
UNIT - VI	**Construction Safety Management**	**(6 Hours)**

	a)Causes of Accidents, Safety measures and policy adopted, Safety Parameters, safety requirements, Personal Protective Equipments. Role of various parties in safety management, safety benefits to employers, employees and customers b) Site Layout:- Factors Affecting site layouts, Typical Layout for major Civil Engineering Project.	

Assignments:

10. Preparation of Site layout.
11. Numerical on Time Value of Money.
12. Application of LPP for civil engg. Problems
13. Preparation of feasibility report –A case study.
14. Study of labour laws
15. Case study on safety Management.

Text Books:

1.S. SeetaramanConstruction Engineering and ManagementUmesh Publications Delhi.

2.L.C.Jhamb volume I,Quantitative Techniques for Managerial Decisions. Everest Publishing House Pune

Reference Books:

6. K.K.Chitkara, Construction Project Management, Tata McGrawHill Education Pvt. Ltd. New Delhi.
7. Edward R. Fisk, Construction Project Administration, Prentice Hall New Jersy Colombus ohio.
8. O.P.Khanna, Industrial Engineering and Management, Dhanpatrai Publications New Delhi.
9. Barrie Paulsion, Professional Construction Management, Tata McGrawHill Education Pvt. Ltd. New Delhi.

10.	Sengupta, Construction Planning and Management**.** McGrawHill Education Pvt. Ltd. New Delhi.
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 B : Maintenance & Rehabilitation of Structures		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Building construction, various techniques of plastering, pointing and concreting
2.	Concrete technology
3.	Properties of R.C. members in flexure.
Course Objectives:	
	The student should be able to use suitable materials and techniques for repair.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	identify need of maintenance and repair of structure.
2.	identify Preventive measures
3.	identify suitable method for evaluating structure.
4.	select suitable material for repair .
5.	select suitable techniques for repair
6.	prepare report on repair &rehabilitation work.

UNIT - I	**Introduction**	**(06Hours)**
	Properties of concrete - Strength, Permeability, Durability, Stiffness, Ductility, Thermal properties & Cracking. Maintenance, Repair, Strengthening and Retrofitting of structure	
UNIT - II	**Preventive measures and Maintenance**	**(06Hours)**
	Effect of climate, temperature, chemicals, wear and erosion, Design and construction errors, Corrosion mechanism, Effect of cover, thickness and cracking, method of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and catholic protection, Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects.	
UNIT - III	**Non Destructive Testing and Structural Audit**	**(06 Hours)**
	Inspection, Causes of deterioration, Non destructive testing methods and testing techniques, Assessment procedure for evaluating a damaged structure, Structural Audit and its report. .	
UNIT - IV	**Materials for Repair and Retrofitting**	**(06 Hours)**
	Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, Sulphur infiltrated concrete, ferro-cement, fibre reinforced concrete, Rust eliminators and polymers coating for rebars, foamed concrete, mortar and dry pack, vacuum concrete, Mortar repair for cracks, shoring and under pinning.	
UNIT - V	**Techniques for Repair and Retrofitting**	**(06 Hours)**

	Selection of suitable material, Technique to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, Gunite and Shotcrete, Epoxy injection, fire, leakage, marine exposure.	
UNIT - VI	**Case Study on Repair & Rehabilitation of structure.**	**(06 Hours)**
	Case study report on Maintenance repair & Rehabilitation of a structure.	

Assignments:

16. Assignment based on properties of concrete.
17. Assignment based on need of maintenance and repair
18. Assignment based on Preventive measures
19. Assignment based on maintenance
20. Assignment based on Non destructive testing
21. Assignment based on Structural Audit and its report
22. Assignment based on various materials for repair.
23. Assignment based on market survey of various materials for repair.
24. Assignment based on various techniques of repair.

Text Books:

6.	M.S.Shetty, "Concrete Technology – Theory and Practice", S . Chand & Company, New Delhi, 1992.
7.	Denison Campbell, Allen and Harold Roper, "Concrete Structures" , Materials, Maintenance and Repair ,Longman Scientific and Technical UK ,1991.
8.	R.T.Allen and S.C.Edwards, "Repair of concrete Structures" , Blakie and Sons, UK,1987

9. Raikar, R.N., "Learning from failures –Deficiencies in Design" ,Construction and service-R&D Center (SDCPL),RaikarBhavan Bombay,1987.	
Reference Books:	
1. Santhakumar, A.R., "Training Course notes on Damage Assessment and repair in LowCost Housie", "RHDC-NBO" Anna University, July,1992	
2. Lakshmipathy, Metal Lecture notes of Workshop on "Repairs and Rehabilitation of Structures",29-30th October 1999.	
3. N.Palaniappan, "Estate Management, Anna Institute of Management", Chennai, 1992	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 C:Environmental Impact Assessment

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Basic Knowledge of Physics, Chemistry and Mathematics
2.	Basic Knowledge of Environmental Science
3.	Basic Knowledge of Statistics and Computers
Course Objectives:	
	To learn the purpose and aims of EIA as well as EIA administration and practice thereby undertaking an EIA projects by understanding of the strengths and limitations of EIA with the costs and benefits of undertaking EIA
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Appreciate the purpose and role of EIA in the decision-making process and understand the strengths of EIA in regard to environmental management;
2.	Understand the technical and social/political limitations of EIA and know the administration and procedures that apply in the student's jurisdiction;
3.	Understand the screening process and the scoping process and how it is applied
4.	Know the options for estimating environmental and social impacts and the format of an EIA Report (Environmental Impact Statement, or Environmental Statement);
5.	Appreciate the factors that assist, and destract, from the usefulness of the EIA Report

6.	Understand the purpose of developing follow-up procedures, and the options for designing these procedures.	
UNIT - I	**Environmental Impact Assessment (EIA)**	**(6Hours)**
	EIA: Background, Introduction, Purpose and aims of EIA, Nature and Scope of environmental issues and impacts, Principles of EIA administration and practice, Key elements of the EIA process, Costs and benefits of EIA, EIA Policy and Legislation, EIA Requirements of International Organizations, Principles for a Functional EIA System	
UNIT - II	**Screening and Scoping**	**(6Hours)**
	Screening: Introduction, Screening procedure, Project lists for screening, Preliminary EIA, Screening Basics, Other types of Screening, Criteria for the determination of the need for, and level of, EIAScreening Exercise, **Scoping**: Introduction, Purpose of scoping, Approaches to scoping, Scoping methods, Scoping Basics, Alternatives and tiering, Scoping in Practice	
UNIT - III	**Impact analysis and EIA Methods**	**(6Hours)**
	Implications of the widening environment and sustainability agenda, Impact Identification, Impact Analysis/Prediction, Impact Analysis Basics, Characteristics of environmental impacts, Impact Characterization, Social Impact Assessment, Evaluation of impact significance, Significance Criteria, Impact Significance Assessment, Interaction Matrix and Simple Checklist Methods, Development of a Simple Matrix, Observations on Simple Matrices, Simple Checklists	
UNIT - IV	**Mitigation and Impact Management**	**(6Hours)**

	Link between EIA process and Mitigation, Main Elements of Mitigation, Mitigation Basics, Approaches to Mitigation, Mitigation of Specific Impacts, Environmental Management Plan and Mitigation Measures, Impact Assessment and Mitigation, Public involvement: Introduction, Principles of public involvement, Scope of involvement, Planning a public involvement programme, Public involvement techniques, Arguments for and against public involvement, Stakeholders involved	
UNIT - V	**EIA Reporting and Review of EIA Quality**	**(6Hours)**
	EIA Report, Typical Elements of an EIA Report, EIA Reporting Basics, Shortcomings encountered in Preparing EIA Reports, Guidelines for effective EIA report preparation and production, The Non-Technical Summary/Executive Summary, EIA Reporting Practice, Role and Purpose of the EIA Review Process, Need for a Systematic Approach, Procedural Aspects, Main Steps in the EIA Review, EIA Quality Basics, Carrying out the review, EIA Report Quality Assessment Exercise, Procedures for Evaluating EIA Reports	
UNIT - VI	**Decision-making, Implementation and Follow-up**	**(6 Hours)**
	Role of the Decision-makers, EIA as part of the Decision-making Process, Decision-making: Procedural Considerations, Responsibility of the Decision-Makers, Key Objectives of EIA implementation and follow up, Tools for Environmental Management and Performance Review, Monitoring, Implementation Management Planning, Environmental Auditing, EMP and Audit Programme, Evaluation of EIA Effectiveness and Performance	

Assignments:

1. The ways of modifying a project through EIA.
2. Legislative protections on a proposed development site in India
3. Some of the problems and advantages having the developer and/or consultant responsible for preparing the EIA documents
4. EIA Challenges especially in developing countries

5. Project of State Significance in India and what role does it play in the Indian system

6. Inventorisation of the natural resources available in India

Text Books:

1. Environmental Impact Assessment: A Practical Guide, Betty Marriott - 1997
2. Environmental impact assessment, Larry W. Canter - 1977
3. Introduction to Environmental Impact Assessment, John Glasson, RikiTherivel, Andrew Chadwick - 2013
4. Environmental Impact Assessment, Stephen Tromans - 2012
5. Environmental Impact Assessment: Practice and Participation, Kevin Hanna - 2015
6. Environmental Impact Assessment: A Methodological Approach, Richard K. Morgan - 1999
7. Methods of Environmental Impact Assessment, Peter Morris, RikiTherivel – 2001
8. Environmental Impact Assessment: A Guide to Best Professional Practices, Charles H. Eccleston - 2011
9. Introduction to Environmental Impact Assessment, John Glasson, ,RikiTherivelAndrew Chadwick - 2005

Reference Books and Further Reading:

1. Ackland A, Hyam P and Ingram H (1999) *Guidelines for Stakeholder Dialogue â€“ A Joint Venture*. The Environment Council, London.
2. *African High-Level Ministerial Meeting on Environmental Impact Assessment (EIA) Durban, South Africa*. Communique (1995) issued by UNEP, Nairobi.
3. Ashe J and Sadler B (1997) Conclusions and Recommendations. In *Report of the EIA Process Strengthening Workshop*. (pp.109-118). Environment Protection Agency, Canberra.
4. Au E and Sanvicens G (1997) *EIA Follow up and Monitoring in Report of the EIA Process Strengthening Workshop* (pp. 91-107). Environment Protection Agency, Canberra.
5. Australian and New Zealand Environmental and Conservation Council (ANZECC) (1996) *Guidelines and Criteria for Determining the Need for and Level of Environmental Impact Assessment in Australia*. Working Group on National Environmental Impact

Assessment, ANZECC, Canberra.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 D: Bridge & Tunnel Engineering		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Engineering Geology
2.	Geotechnical Engineering
3.	Infrastructure Engineering, Traffic Engineering
4.	Surveying
5.	Hydraulics
6.	Structural Engineering
Course Objectives:	
	To make the student understand various types of bridges & tunnels & their components. Students would also be able to decide factors affecting selection of bridge & tunnels.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	describe bridge classifications & bridge components.
2.	explain various forces acting on bridges.
3.	manifest bridge bearings & its importance.
4.	explicate tunnels & its site selection.
5.	annotate various tunneling methods.

6.	construe various safety requirements & maintenance methods in tunneling.	
UNIT - I	**Bridge Engineering -: Introduction**	**(06Hours)**
	Definition, Importance of bridge, Classifications of bridge, Components of bridge, Site Selection, Preliminary data to be collected, Determination of design discharge – Lineal waterway, Economical span, Afflux, HFL, Sub-soil exploration – Scour depth, Investigation report, choice of bridge type, quality assurance for bridge projects, Types of Analysis of Economic Costing ,Implemation of Methodology, quality control and assurance for bridge projects	
UNIT - II	**Loading Standards for Design Bridges (With STAAD- Pro and C++)**	**(06 Hours)**
	Evaluation of bridge loading standard as per IRC specifications (dead load IRC, standard live load, Impact effect, wind load, longitudinal forces, centrifugal forces, horizontal forces due to water currents, buoyancy effect, earth pressure, temperature effect, seismic forces), forces acting on abutment, piers, wing wall& superstructure.	
UNIT - III	**Types of bridges, bridge bearings& maintenance of bridges, and Rehabilitation of bridges**	**(06 Hours)**
	Types of bridges; culverts, temporary, moveable, fixed span, Methods of erecting bridges, maintenance of bridges, inspection of bridges, types of failures, bridge foundations (open, caissons etc.), Classification of Highway Bridge parapets, **Bearing;** purpose & importance, materials specification, types of bearings, maintenance& Rehabilitation of Bridges	
UNIT - IV	**Tunnel Engineering -: Introduction**	**(06 Hours)**
	Definition, General aspects, classification, purpose of tunnels, selection of Routeadvantages & disadvantages. Condition favorable for tunnel construction (influence of geological conditions), economics, setting out of tunnels, criterion for selection of size & shape, Open cuts, twin tunnels, pilot tunnels, portals, shafts	

UNIT - V	**Tunneling alignment & methods**	**(06 Hours)**
	Surveying, Preliminary explorations, alignment & Grade, size & cross section of tunnels, types of drills, selection of drilling equipment & pattern, types of explosives, blasting techniques, **Tunneling;** hard rock, soft soils, tunneling methods using TBM, NATM method	
UNIT - VI	**HSE (Health, safety & Environment) requirements & Maintenance of tunnels**	**(06 Hours)**
	Precautions in handling & storing of explosives, safety requirements during blasting operation, lining of tunnels, **Maintenance;** dust prevention, ventilation, Lighting, drainage, Introduction to Metro Tunnels & under water tunnel tubes.	

Assignments: (Any Eight)

25. Write classification of bridges& its component.
26. Enlist & explain different types of load acting on a bridge structure.
27. Briefly explain different types of bridges.
28. Write a short note on bridge bearings (Classification, importance & maintenance).
29. Classify various types tunnels & explain advantages & disadvantages of each.
30. Write a short note on Open cuts, Twin tunnels, pilot tunnels, portals & shafts with neat sketches wherever necessary.
31. Illustrate various preliminary investigations & surveying required for tunnel construction.
32. Write a note on explaining various methods for;
    1) tunneling in soft soils
    2) tunneling in hard rocks
33. Prepare a power point presentation on use of TBM & NATM methods for tunneling.

34. Illustrate briefly the importance of lining, lighting, drainage, ventilation & dust prevention in tunnels.
35. Site visit & preparation of report on any bridge/tunnel structure.
Text Books:
1) Bindra S.P., "Principles & Practice of Bridge Engineering, Dhanpat Rai & Sons Publishers, New Delhi.
2) Rangwala S.C., "Bridge Engineering", Charotar Publishing House Pvt. Ltd., Gujarat.
3) Saxena S.C., "Tunnel Engineering", Dhanpat Rai & Sons Publishers, New Delhi.
4) Srinivasan R., "Harbour, Docks & Tunnel Engineering", Charotar Publishing House, Gujarat.
Reference Books:
1) Bickel J.O., "Tunnel Engineering Handbook", CBS Publishers, New Delhi.
2) Victor D.J., "Essentials of Bridge Engineering", Oxford & IBH Publications Co. Ltd., Mumbai.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 E:- Elective II - Ground Water Hydrology

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:

The Students should have knowledge of

1.	Engineering Geology and Soil Mechanics
2.	Fluid Mechanics

Course Objectives:

	Course attempts to provide knowledge and skills for effective ground water management

Course Outcomes:

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

1.	Explain types of aquifer and its properties
2.	Describe movement of ground water through porous media.
3.	Determine yield of an open and tube well
4.	Explain construction and design of wells
5.	Describe various methods of artificial recharge of ground water
6.	Describe various parameters of ground water quality

UNIT - I	**Introduction**	**(6 Hours)**
	Introduction, Divisions of ground water, Sources of Ground water, Ground Water in various types of rocks, Hydrological Terms , types of aquifer, Porosity, Specific Yield, Specific Retention, Specific yield and its determination,	

UNIT - II	**Movement of Ground Water**	**(6 Hours)**
	Darcy's Equation, Permeability, Factor affecting on permeability, Laboratory and field determination of permeability, Flow net and its properties, Flow net for Isotropic and Anisotropic Aquifer , Ground Water Flow Potential, Steady one Dimensional Flow, Ground Water Theory	
UNIT - III	**Well Hydraulics**	**(6 Hours)**
	Flow into a wells, Dupit's assumption, , Steady radial flow into in unconfined aquifer and confined aquifer, Well losses, Specific Capacity of well, well Efficiency, Interference among wells, Cavity wells, Pumping Test Method:- Theis method, Jacob Method, Chow Method	
UNIT - IV	**Water Well Construction and Design**	**(6 Hours)**
	Types of water wells:- Open Well and Tube well, Method of Construction of open Well and tube well, Design of water well, Infiltration Gallery, water well construction	
UNIT - V	**Ground Water Recharge Methods**	**(6 Hours)**
	Introduction, Methods of Ground water recharge, Types of Artificial and natural ground water recharge, Suitability of artificial recharging methods, Well shrouding and well development, other sources of ground water	
UNIT - VI	**Ground Water Quality and Pollution**	**(6 Hours)**
	Chemical composition of Ground water, water sampling, water quality for Industrial use and Domestic use, sea water contamination in ground water , ground water pollution.	
Assignments:		
36. Determination of specific yield of an aquifer		
37. Use of flow net for ground water studies		

38. Problems on pumping test method.	
39. Assignment on different types of wells	
40. Assignment on ground water quality for industrial use and domestic use.	
41. Visit to nearby water harvesting structure and prepare a report.	
42. Problems on well hydraulics	
Term Work:	
Text Books:	
1 Dr. P.N.Modi, Irrigation Water Resources and Water Power Engineering , Standard Book House 2012	
2. Garg S.K. ,Irrigation Engineering and Hydraulic Structures, Khanna Publisher ,2006	
Reference Books:	
1 Raghunath H.M., Ground Water :, New Age International Publishers	
2 Todd D.K. Ground water Hydrology , John Wiley and sons	
3 Rastogi A.k. , Numerical ground water hydrology, Pennram Publishers	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 F GEOINFORMATICS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Basic knowledge of Physics, Chemistry and Mathematics
2.	Basic knowledge of Geography, Maps and Surveying
3.	Basic knowledge of Computers and graphic softwares
Course Objectives:	
	To provide the students insight of Geoinformatics and its applications in Resource Conservation and Management, Disaster Management, Environmental Pollution Management, Civil Engineering and Construction Management and Sustainable Development
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Apply Geoinformatics technologies and the technologies used in Geographical Studies
2.	Analyze and Understand Aerial Photographs procured from the technology of Aerial Photogrammetry and the information to be retrieved with the help of Visual Interpretation and Stereoscopy
3.	Understand the components and principles of GPS, DGPS Concepts and GPS Applications in Military, Transport network planning and management, Meteorology and climate change, Telecommunications
4.	Apply and use the concept of Remote Sensing and applications in the field of Civil and Environmental Engineering and interpret images and photographs procured from Satellites

5.	Familiarize with various GIS softwares for developing thematic maps byGeo-referencing and Geo-coding and analyze Spatial Data with the help of Digital Elevation Model	
6.	Apply the Geoinformatics techniques in the field of Land Resource, Water Resources, Urban Planning, Geo-technical Engineering, Environmental Management	
UNIT - I	**Geoinformatics**	**(6 Hours)**
	Introduction, Scope and Importance of Geoinformatics, Geoinformatics technologies and the technologies used in Geographical Studies, Geoinformatics and other Information Sciences, Geoinformatics-Spatial and Non –Spatial data Management. Spatial information Technology, Applications of Geo-Informatics:Urban planning and land use management, Tourism, Virtual globes, Environmental modeling and analysis, Military, Transport network planning and management, Agriculture,	
UNIT - II	**Photogrammetry**	**(6 Hours)**
	Aerial Photograph: Introduction, Comparison of Aerial Photograph And Map Aerial Photography: Introduction, Specifications For Aerial Photography, Planning of Photographic Flights, Execution of Flight, Aerial Cameras, Aerial Films, Completion of Photographic Task, Production of Positive Copies Aerial Mosaics: Introduction, Planning for Mosaics, Mosaic Compilation, Annotation and Reproduction, Choice of Methods	
UNIT - III	**Global Positioning System**	**(6 Hours)**
	Introduction, Components of GPS, Operational Principle, Facts and Limitations of GPS, GPS Receivers, Total Station Surveys Differential GPS: Introduction, DGPS Concepts, Types of DGPS GPS Applications in Military, Transport network planning and management, Meteorology and climate change, Telecommunications	

UNIT - IV	**Remote Sensing (RS)**	**(6 Hours)**
	Basic Concepts: Introduction,Multispectral Remote Sensing, Multispectral Photography, Multispectral Scanning Remote Sensing in Thermal Infrared Region, Emissivity, Thermal Infrared Sensors, Characteristics of Thermal Images, Applications Remote Sensing in Microwave Region: Passive System, Active System, Satellite Radar Systems, Radar Image Characteristics, Radar Image Interpretation Satellite Remote Sensing: Introduction, LANDSAT, IRS and Other Satellites Satellite Image Interpretation: Visual Interpretation, Digital Image Processing, Applications of Satellite Imagery.	
UNIT - V	**Geographical Information System (GIS)**	**(6 Hours)**
	GIS Concept: Functions and use of GIS, Spatial Data Representation, Relationships of Spatial Objects, GIS Functions, Spatial (Raster and Vector) and non-spatial (Relational, Network and Hierarchical), Geo-referencing and Geo-coding, Spatial Data Analysis, Digital Elevation Model	
UNIT - VI	**Remote sensingGIS Applications**	**(6 Hours)**
	Application in Land Resource: Remote sensing in mapping soil degradation, impact of surface mining on land resources, forest resources. Application in Water Resources: Remote sensing in hydro-geomorphologic interpretation for groundwater exploration, reservoir sedimentation, . Application in Urban Planning: Mapping urban landuse, transportation network, ity mapping, urban sprawl, site selection for urban development, Urban Information System Application in Geo-technical Engineering: Slope stability and drainage network analysis, Digital Terrain Modeling, Application in Environmental Management: Selection of disposal sites	

	for industrial and municipal wastes,	

Assignments: (At least 10 assignments out of 12 to be completed)

1. Arial photograph interpretation
2. Visual interpretation of multispectral and panchromatic image
3. Image rectification and classification, supervised and unsupervised classifications
4. Digital database creation – Point features, Line features, Polygon features
5. Data Editing-Removal of errors – Overshoot & Undershoot, Snapping
6. Construction of different thematic maps in GIS
7. Introduction to GPS and initial setting
8. Point Data collection using GPS with different datum
9. Case studies on Applications of Remote sensing and GIS in Urban planning
10. Case studies on Applications of Remote sensing and GIS in water resources
11. Case studies on Applications of Remote sensing and GIS in environmental management
12. Case studies on Applications of Remote sensing and GIS in agriculture.

Text Books:

1. An Introduction to Geoinformatics - G. S. Srivastava, McGraw Hill Education; First edition
2. Jensen, J.R., "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi, 2000
3. George Joseph, "Fundamentals of remote sensing", Universities press (India) Pte Ltd., Hyderabad, 2003
4. Kang-tsung Chang 2002,'Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi.
5. C.P.Lo and Albert K.W.Yeung 2005 "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India,New Delhi.

6. Leicka. A.: GPS Satellite Surveying, John Wiley & Sons, use. New York
7. Terry-Karen Steede, 2002, Integrating GIS and the Global Positioning System, ESRI Press
8. Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany.
9. Lillesand, Thomas M. and Kiefer, Ralph, W., "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York, 2000
10. Rampal, K.K., Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi, 1999

Reference Books:

1. Sabins, F.F. Jr., 'Remote Sensing – Principles and Interpretation", W.H. Freeman & Co., 2002 Edition.
2. Reeves, Robert G., "Manual of Remote Sensing, Vol. I, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia, USA
3. Burrough, Peter A. and Rachael McDonnell,1998, ' Principles of Geographical Information Systems' Oxford University Press, New York.
4. Magwire, D. J., Goodchild, M.F. and Rhind, D. M. Ed. 1991,'Geographical Information Systems: Principles and Applications', Longman Group, U.K.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 G : Advances in Concrete Technology and Composites

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites:	
The Students should have knowledge of	
1.	Engineering Chemistry
2.	Basic Concrete Technology
3.	Construction practices
4.	Construction methods
Course Objectives:	
	The student should be able to know properties of various types of advanced concretes, concreting methods and special types of concretes and their use.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	know properties of various properties of advanced concrete, carry out mix design as per I.S. Code method.
2.	know the properties and use of advanced concreting methods.

3.	know the properties and use of special concreting methods.
4.	analyse and design prefabricated concrete, know the use precast concrete elements.
5.	know the properties of concrete with mixed ingredients.
6.	know the properties and use of special types of concrete.

UNIT - I	**Introduction**	**(06 Hours)**
	Review of concrete as a structural material, study of concrete and its various ingredients for the properties such as strength, elasticity, shrinkage, creep, permeability, durability as Mix Design by I.S .Code Method, design of high strength mixes containing entrained air.	
UNIT - II	**Advanced Concreting Methods**	**(06 Hours)**
	Study of Roller Compacted concrete, High Performance Concrete, Cold Rolled Concrete.	
UNIT - III	**Special Concreting Methods**	**(06 Hours)**
	Study of Underwater concreting, Tri mix Concrete, Self Compacting Concrete.	
UNIT - IV	**Precast Concrete**	**(06 Hours)**
	Analysis and Design of prefabricated concrete, Precast concrete construction joints in precast construction, erection and assembly techniques.	
UNIT - V	**Concrete Composites**	**(06 Hours)**
	Fiber Reinforced Concrete using carbon, glass, steel, polypropylene fibers for its various properties.	
UNIT - VI	**Special Types of Concrete**	**(06 Hours)**

	Ferro cement, Light Weight & High Density Concrete for its various properties.	
Assignments: Any six from the list given below.		
43. Assignment based on I.S.code mix design of concrete		
44. Assignment based on advanced concreting methods.		
45. Assignment based on special concreting methods.		
46. Assignment based on precast concrete		
47. Assignment based on carbon and glass fibre reinforced concrete.		
48. Assignment based on steel fibre reinforced concrete.		
49. Assignment based on polypropylene fibre reinforced concrete.		
50. Assignment based on special types of concrete.		
51. Assignment based on visit to sites of precast concrete		
52. Assignment based on actual survey on use of special concrete at various locations.		
Text Books:		
10.	M.S. Shetty -"Concrete Technology" --, S. Chand Publications	
11.	A R Santhakumar, -"Concrete Technology "-- Oxford University Press.	
12.	M. L. Gambhir, -"Concrete technology" -- Tata Mcgraw Hill Publications	
13.	P.N.Balguru & P.N.Shah "Fiber Reinforced Cement Composite" Wheeler Publications-.	
14.	P. Kumar Mehta and P. S. M. Monteiro—"Concrete: Microstructure, Properties and Materials"-- Tata Mc-Graw Hill Education Pvt. Ltd.	
Reference Books:		

11.	A. M. Neville “Properties of concrete”, Longman Publishers.
12.	R.S. Varshney “Concrete Technology “ Oxford and IBH.
13.	N V Nayak,A .K.Jain “Handbook on Advanced concrete Technology” Edited by, Narosa Publishing House
4.	Dr. D.B.Divekar “Ferrocement Construction Mannual- -Pune
5.	Prof. Gajanan Sabnis”Concrete Mix Design---

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

48 : COMPUTER APPLICATIONS IN CIVIL ENGINEERING-IV

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Practical: 02 Hours / Week	Term Work and Oral: 50 Marks	Termwork: 01Credit

Course Pre-requisites:

The Students should have knowledge of

1.	Structural Analysis-I & II
2.	Structural Design- II

Course Objectives:

	The student should be able to design RCC structure using STAAD.Pro

Course Outcomes:

On completion of the course, using STAAD.Pro the students will be able to:

1.	Analyse the Building frame and calculate design forces in the members
2.	Design RCC members
3.	Design RCC Framed Building

UNIT - I	**Structural Analysis**	**(08 Hours)**

	Generation of skeletal model, Defining cross section and section properties, Generate and assign different types of supports, assign different types of nodal and member loads, Define load combination, analysis, static check, load list, post analysis, extract output/result of axial force, shear force, bending moment, torsional moment, deflection etc.	
UNIT - II	**RCC Design**	**(08Hours)**
	Staad -Design parameters as per IS456-2000 and their significance, Design of Beam, Design of Column, Check code, Check members passing and failing, Redesign for optimization, Calculation of material quantities, Design Reports	

Term Work:	
4.	Analysis of Building frame and calculation of design forces in the members
5.	Design of RCC Framed Building.
Text Books:	
1.	T.S. Sharma, "Staad.Pro v8i for beginners" , Notion Press
2.	Sivakumar Naganathan, "Learn Yourself STAAD.Pro V8i",Lap Lambert
Reference Books:	
14.	Bentley Structures, "Staad.Pro Technical reference manual", Bentley Community e-book
15.	IS 456 -2000

49: Project Stage I		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Practical: 02 Hours / Week	Term Work and Oral: 50 Marks	Termwork: 04 Credits

Course Pre-requisites:	
The Students should have knowledge of	
1.	Engineering Mathematics
2.	Written and Communication skills
3.	Analytical skills
4.	Project planning and design
5.	
Course Objectives:	
	The student shall be able to identify the problem and suitable solution for the same.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Perform the literature review
2.	Identify the grey area as the topic for work.

3.	Decide the methodology	
	The project work shall consist of any project pertaining to Civil Engineering field or interdisciplinary field. The work may consist of any one or more of the following: 1. Critical Survey of literature 2. Experimental investigations 3. Design and fabrication of model 4. Design problems – use of latest software 5. Industrial assignments / field survey and analysis Use of computers, laboratory testing, projects sponsored by industry are preferred. Stage I consist of 1. Defining the topic of the project, scope of the project and experimental and design work involved. 2. Completing the literature review and methodology pertaining to the topic selected. 3. A report / term work is tobe prepared on work done in stage I TW & ORAL: It shall be based on work completed in stage I and the Termwork / Report submitted.	

50: Inplant Training		
	EXAMINATION SCHEME:	**CREDITS ALLOTTED:**
Duration: 45 days	Term Work and Oral: 50 Marks	Termwork: 03 Credits

Course Pre-requisites:	
The Students should have knowledge of	
1.	Building construction,building Planning, Surveying, Advanced Surveying
2.	Concrete Technology
3.	Hydraulic Engineering, Irrigation Engineering
4.	Infrastructure Engineering,
5.	Estimation, Costing and Valuation
Course Objectives:	
1.	The student shall be able to identify various problems faced on site.
2.	The student shall be able to find read the drawings and find out the quantities from them
3	The student shall be able to know methods of concrete mix design, design of various civil engineering structures.
Course Outcomes:	

On completion of the course, the students will be able to:		
1.	complete the inplant training for 45 days in Civil Engineering/construction Industry /govt. organization/research organisation related to civil engineering.	
2.	know and implement various terms and problems on sites /design office related to civil engineering.	
3.	prepare the log book of day to day activities during his/her inplant training period and get it signed every day from the supervisor	
4.	complete a technical report/log book of his/her inplant training for 45 days duly certified by the officer in charge for the training.	
5.	explain and grade his/her experience of inplant training based on the knowledge received.	
6.	satisfactorily answer the questions and queries on work/experience of his/her inplant training completed.	
UNIT - I	**Title**	**(Hours)**

	In view of getting exposure to industry / site / design office, a student has to undergo the inplant training for 6 weeks / 45 days in one of the Civil Engineering areas. The training may consist of any one or more of the following: 1. Working on any site with substantial work related to Civil Engineering 2. Working in any design office with work related to Civil Engineering Design 3. Working in any Civil Engineering industry / Government organisation / research organisation Report: A report on above training and the work completed during training duly certified by officer incharge for the training. The report to be submitted within fifteen days from the date of completion of the training. Termwork and Oral: Termwork and Oral examination shall be based on the Termwork submitted.	

51: Earthquake Resistant Design of Structures

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork:01 Credit

Course Pre-requisites:

The Students should have knowledge of

1.	Basic concepts of equilibrium of a structure
2.	Concepts of shears and moments in a frame
3.	Geological concepts in civil engineering
4.	Design of R.C.C. elements using limit state design.
5.	Concept of various forces acrting on a frame and analysis of a frame.

Course Objectives:

	The student should be able to know various causes of earthquakes, their types, various methods of determination of earthquake forces, design a shear wall and ductile detailing of buildings.

Course Outcomes:

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

1.	describe the causes and characteristics of earthquakes, effects of earthquake and various seismic zones

2.	define single and multiple degree freedom system, different types of vibrations.
3.	calculate the earthquake forces using Equivalent Static method as per I.S.1893-2002.
4.	determine the earthquake forces using Dynamic method as per I.S.1893-2002, decide the choice of method.
5.	design a shear wall by understanding the concept behind it.
6.	design the various provisions in buildings for earthquake resistance and the ductile detailing provisions as per I.S. 13920-1993.

UNIT - I	**Earthquake and their effects**	**(06 Hours)**
	Geology of earth, configuration of tectonic plates in a globe, influence of Geology on earthquake, behavior of plates, their motion and effects, causes of earthquake ,Characteristics of Earthquakes, Earthquake parameters, magnitudes, intensity, scales, classification of earthquake, seismic zoning of India, seismic coefficients for different zones, Effects of earthquakes on buildings	
UNIT - II	**Theory of vibrations**	**(06 Hours)**
	Vibrations - definition, causes, classifications. Single Degree of Freedom systems (SDOF) - Free, forced, damped, un-damped vibrations with basic examples. Introduction to Multi-degrees of Freedom systems (MDOF)	
UNIT - III	**Determination of Earthquake forces-Static Method**	**(06Hours)**
	Introduction to IS1893 (Part-I): 2002, Seismic design Philosophy, basic definitions, Concept of OMRF &SMRF frames, Seismic coefficient method, Determination of base shear ,Lateral force , storey shear diagram, application to cantilevers	

UNIT - IV	**Determination of Earthquake forces-Dynamic Method**	**(06 Hours)**
	Dynamic Methods, Response Spectra Method as per I.S. 1893,Choice of Method	
UNIT - V	**Design of Shear Wall**	**(06 Hours)**
	Concept of Shear Wall in earthquake resistance, Design of Shear wall	
UNIT - VI	**Earthquake Resistance Provisions**	**(06 Hours)**
	General Provisions and rules to be followed for buildings in seismic areas, Various irregulations in buildings, Ductile detailing of earthquake resistant design as per IS 13920:1993	
Assignments: Any six from the list given below.		
53. Assignment based on geology of earthquakes, causes of earthquakes.		
54. Assignment based on effects of earthquakes, seismic zones		
55. Assignment based on calculation live loads at different storey levels..		
56. Assignment based on different types of vibrations.		
57. Assignment based on calculation of various loads for different types of frames.		
58. Assignment based on calculation of various loads for different types of soils.		
59. Assignment based on calculation of various loads in different zones.		
60. Assignment based on single degree freedom and multiple degree freedom system.		
61. Assignment based on various irregularities in buildings.		
62. Assignment based on ductile detailing as per IS 13920		
Term Work:		
6. Termwork should be based on above syllabus		

7.	Termwork should consist of i) projects on determinations of Earthquake forces using static method ii) projects on determinations of Earthquake forces using dynamic method iii) project on design of shear wall.
Text Books:	
1.	B.N.Duggal "Earthquake resistance design of structure - Oxford University Press.
2.	Dr. Vinod Hosur " Earthquake – Resistant Design of Building Structures"- Wiley India
3.	Earthquake Tips NICEE, IIT, Kanpur
4.	Jaikrishna and Chandra shekharan "Elements of Earthquake Engineering "
5.	N.Subramanian " Design of Steel Structures", Oxford University Press
Reference Books:	
16.	Clough R.W. and Penzin J "Dynamics of structure'. McGraw Hill Civil Engineering
17.	Anil Chopra "Dynamics of structure ', Prentice Hall India Publication
18.	Mario Paz " Dynamics of structure", CBSPD Publication
19.	Kramer S. L. 'Geo-technical Earthquake Engineering ',Prentice Hall India Publication
20.	John M. Biggs "Introduction to Structural Dynamics'
21.	I.S.1893-2002 and I.S. 13920-1993

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

52: Water Resources Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 4 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 1 Hour / Week	Term Work and Oral: 50 Marks	Term work: 1 Credit

Course Pre-requisites:

The Students should have knowledge of

1.	Fundamentals of Soil and Fluid Mechanic.
2.	Fundamentals of Mathematics and Statistics.

Course Objectives:

	Students will study hydrological analysis and design hydraulic structures.

Course Outcomes:

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

1.	Describe methods of Measurement of precipitations and its analysis for planning water resources project.
2.	Describe methods of estimation of evaporation and infiltration and their use for hydrological studies.
3.	Describe the methods of stream flow measurement and design the flood hydrograph.
4.	Describe process of reservoir planning and design the gravity dams.
5.	Design and construction of earth dams.
6.	Hydraulic design of spillways and energy dissipation arrangement.

UNIT - I	**Precipitation and its measurement**	**(06 Hours)**

	Introduction to Hydrology , Hydrological Cycle, Applications in Engineering, Formation of precipitation, Types of Precipitations, Measurement- raingauges, estimation of missing data, mean precipitation over an area, presentation of rainfall data, depth area duration relationship, intensity duration frequency relationship, frequency of point rainfall	
UNIT - II	**Evaporation and Infiltration**	**(06 Hours)**
	Initial losses, Evaporation Evapo transmeters, imperial methods for estimation of evaporation, evapotranspiration, methods to reduce evaporation, infiltration process, factors affecting infiltration, infiltration equations, measurement of infiltration, infiltration indices,	
UNIT - III	**Stream Flow Measurement and Hydrograph**	**(06 Hours)**
	Stream flow measurement, measurement of stage, measurement of velocity, area velocity method, slope area methods dilution techniques/tracer methods, run off, factors affecting, hydrograph, Unit hydrograph, theory and applications. Methods of flood estimation, rational method.	
UNIT - IV	**Reservoir planning and Gravity dams**	**(06 Hours)**
	Investigations for reservoir planning, various storage zones, estimation of reservoir capacity by mass curve method, Gravity dams forces acting and their combinations, criteria for structural stability, modes of failure, elementary profile of gravity dam, construction of gravity dam, Use of colgrout masonry ,foundation treatment.	
UNIT - V	**Earth dams**	**(06 hours)**
	Classification of earth dams, method of construction ,basic design considerations in design of section, phreatic line and its location, stability of slopes ,design of filters ,rock toe and pitching, internal drainage arrangement, cut of trench. Causes of failure of earth dams.	
UNIT - VI	**Spillways and hydropower structures**	**(06 Hours)**

	Introduction , function , components, classification ,selection of type of spillway, hydraulic design of ogee spillway, Energy dissipation below spillway- hydraulic jump type and bucket type, spillway gates.	

Assignments:

63. Numericals on precipitation.
64. Estimation of net run off from given catchment knowing the infiltration index.
65. Numericals on
66. Unit hydrograph.
67. Case studies on types of gravity dams.
68. Report on colgroute masonry construction of gravity dams.
69. Numericals on spillways
70. Study of different sections of earth dams used in field for different site conditions and different materials.

Term Work: Term Work will consist of minimum eight assignments from list given below.

8.	Marking the catchment area for a given reservoir site on topographical maps and Estimation of Mean precipitation for given catchment area.
9.	Estimation of reservoir capacity by mass curve method
10.	Design a flood hydrograph from a given unit hydrograph.
11.	Design of hydrographs of different duration from a given UH.
12.	Site Visit to water resources project.
13.	Stability analysis of gravity dams.
14.	Stability analysis of earth dams.
15.	Hydraulic design of spillway and energy dissipation arrangement.
16.	Study and draw typical layout of high head hydropower plant.

Text Books:	
15. Dr. P.N. Modi “Irrigation Water Resources and Water Power Engineering “ , Standard Book House.2014	
16. S. K. Garg “Irrigation Water Resources and Water Power Engineering” Khanna Publishers, 2006.	
17. ” K. Subramanian “Engineering Hydrology” Tata Mc Graw Hill 2015	
18. Dr P. Jaya Rami Reddy “A Text Book of Hydrology” . University Science Press New Delhi.2008	
Reference Books:	
1 V.T. Chow “Applied Hydrology “, Mc Graw Hill Publications 2003	
2 R.S. Varshney Concrete dams , , Oxford and IBH ,2000	
3 Bharat Singh and R.S.Varshney Embankment dams , Oxford and IBH ,2000	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

53 :Infrastructure Engineering		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	surveying.
2.	concrete technology.
3	geotechnical engineering.
4	foundation engineering.
Course Objectives:	
1)	To make the student understand & design various components of a railways, highway & airport.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	carry out surveys involved in planning & highway alignment.
2.	carry out traffic survey & geometric design for highway construction.
3.	describe flexible & rigid pavements as per IRC
4.	describe various components of permanent way.
5.	construe geometric design of a railway track & signaling in railways.
6	annotate components of an airport.

UNIT - I	**Highway Engineering**	**(06 Hours)**

	Scope of Road transportation, Highway Development in India, **Road Plans:** Nagpur, Bombay & Lucknow, determination of road length. Road Classification & patterns, preliminary surveys, Highway alignment, Repairs & maintenance, quality control, concept of BOT, BOOT & BOLT.	
UNIT - II	**Traffic Engineering & Geometric design**	**(06 Hours)**
	Traffic Engineering: Traffic characteristics, Volume studies, speed studies, capacity, density, traffic regulations & control device, types of road intersection. **Geometric Design :** Camber, Super Elevation, Road Margin, pavement width, right of the way, gradient, sight distance, stopping distance, shoulder, design speed, cross section of roads (cutting & embankment), Highway drainage. **Curves:**horizontal transition curves, grade compensation on horizontal curves, vertical curves.	
UNIT - III	**Pavement Design & Highway Materials**	**(06Hours)**
	Road Pavement: types, design factor, design of flexible pavement by CBR method (IRC 37- 2001 & 2012), methods of rigid pavement design (IRC 58 – 2002), load & temperature stresses (IRC recommendations for Road failure), Joints. **Highway Materials:** Importance & properties of sub grade (soil), pavement component materials, aggregates. **Bitumen:** Types, Bitumen mix design (Marshall stability test).	
UNIT - IV	**Railway Engineering**	**(06 Hours)**
	History & Development, comparison to different modes of transports, Location surveys & alignment, permanent way, gauges, necessity of uniformity of gauges. **Rails:** types & functions, defects, rail flaw detector, joints. **Sleepers:** classification & functions, sleeper density Ballast, formation & subgrade, rail fixtures & fastening**,** L.W.R.&	

	S.W.R., advantages of welded joints.	
UNIT - V	**Geometric Design, Points, Crossings & Signaling in railways**	**(06 Hours)**
	Geometric Design: Cross-sectional elements of a railway tract, Gradient, Curves, Super Elevation, cant deficiency. **Points & Crossings**: Types, Turnouts, design of diamond crossing & cross over. **Signaling:**Objects, principles & classification, interlocking, turntable, buffer stops, scoth block. Introduction to Metro, mono rails& Pod taxi.	
UNIT - VI	**Airport Engineering**	**(06 Hours)**
	Airport: planning & layout, classification, orientation, aircraft characteristics, airport obstructions, Runway, taxiway, aprons, terminal area.	

Assignments:

71. Solve numerical problem on determination of road length according to Nagpur, Bombay & Lucknow plan.
72. Write a short note on BOT, BOOT & BOLT type of projects.
73. Define all the terms related to cross section of highway with neat sketches of each (in embankment & cutting).
74. Solve a numerical on calculationof sight distance on highway.
75. Write a short note on pavement design of highways (Flexible & Rigid) according to IRC guidelines.
76. Draw a neat sketch of a cross section of a railway track explaining all its components & their functions.
77. Write a short note on Gradients, Curves, Super Elevation, cant deficiency.

78. Explain the advantages of SWR & LWR.

79. Write classification of different types of signals & briefly explain semaphore signal.

80. Draw a layout of an airport illustrating all its components& their functions.

81. Write a short on Inland Waterways & its scope in India.

Term Work:

1) List of experiments: test on aggregates (any four)
   a) Aggregate Impact Test
   b) Los Angeles Abrasion Test
   c) Crushing Test on aggregates
   d) Flakiness Index & Elongation Index
   e) Specific gravity & Water absorption test
   f) Bitumen stripping value Index
   g) Use of Antistripping compound

2) List of experiments:test on Bitumen (any five)
   a) Specific gravity test
   b) Penetration test
   c) Ductility test
   d) Softening point test
   e) Viscosity test
   f) Flash point & Fire point test
   g) Benkelman Beam Test
   h) Marshal stability test

3) List of experiments: test on soil.
   a) California Bearing Ratio Test

Text Books:

1) Khanna S.K. & Justo C.E.G., “Highway Engineering”, Nem Chand & Bros Publishers, Roorkee, Uttarakhand.

2) Arora & Khanna, “Airport Engineering”, Nem Chand & Bros Publishers, Roorkee, Uttarakhand.

3) Saxena S.C., “A Text book of Railway Engineering”, DhanpatRai& Sons Publishers, New Delhi.

Reference Books:

1) Mundrey J.S., “Railway Track Engineering”, Tata McGraw Hill Publications, New Delhi.

2) Satish Chandra & Agrawal M.M., “Railway Engineering”, Oxford University Press, New Delhi.

3) ParthaChakraborty&Animesh Das, “Principles of Transportation EngineeringEngineering”,

4) Norman J. Ashfor, Saleh A. Mumayiz&Paul H. Wright, “Airport Engineering: Planning, Designand Development of 21st-Century Airports”, John Wiley & Sons Publishers,New Delhi

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 A : Disaster Management		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50Marks	Termwork: 01 Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Engineering Geology
2.	Advanced Surveying
3.	Project Management
Course Objectives:	
	To make the student understand various disaster management strategies for massive hazards.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	construe various disasters & role of civil engineer during such hazards.
2.	manifest various geological disasters & their consequences.
3.	explicate various hydro-meteorological disasters.
4.	annotate various disaster management & risk assessment strategies.
5.	describe use of various scientific & technological tools for disaster forecasting & its dissemination as warning.
6.	explicate various disaster management techniques used for rescue operations during the disaster.

UNIT – I	**Disaster Management : Understanding disasters**	**(06 Hours)**

	Disaster-Definition & Concept, Types, Mitigation, Preparedness, **Phases of Disaster Management-**response, recovery, rehabilitation, information & public awareness, role of government in disaster management (NIDM), principle components of disaster management, organizational structure for disaster management, study of recent disasters, role of Civil Engineer in disaster management.	
UNIT – II	**Geological & Manmade Disasters**	**(06 Hours)**
	Earthquake- Different types of earthquake waves, seismic zoning of India, liquefaction of soil **Tsunami-**The process of triggering waves, dynamics of tsunami waves, management of tsunami disaster **Landslides-**causes, signs, early warnings systems, means of mitigation **Blasts-**Mechanism, causes, characteristics, preventive and control measures of fire, Investigation after explosion.	
UNIT – III	**Cyclones, Flood, Drought& Fire disasters**	**(06 Hours)**
	Cyclones- major location of occurrence, intensity of classification, cyclone, management & mitigation **Flood-**types of flood, effects of flood, flood defenses & management, **Drought**- concept of Drought, consequences of drought, management & risk reduction, mitigation **Fire-**detection & alarms, fire resistance, fire endurance, mitigation measures	
UNIT – IV	**Disaster Management Cycles,**	**(06 Hours)**
	Disaster management cycle-Paradigm shift in disaster management, financial relief expenditure, legal aspects, rescue operations, risk management (pre & post disaster), zone & macro zone formation, **Infrastructure-**early recovery, reconstruction & redevelopment, **Disaster prevention &Risk assessment strategies-** IDNDR, Yokohama Strategy, Hyogo framework of action	
UNIT – V	**Application of Science & Technology for Disaster Management**	**(06 Hours)**

	Geo- informatics tools in disaster management, prediction & assessment (RS, GIS & GPS), buoys, Disaster Communication system (Early Warning & its dissemination), Disaster safe designs constructions,	
UNIT – VI	**Emergency Management**	**(06 Hours)**
	Rescue operations- use of Helicopters, transportation, detection of areas of disasters, Global, National, Local management systems for various disasters, Short term/long term effects & measures to be taken to overcome, SWOT analysis based on design & formulation strategies, S & T institution for disaster management, methods of assessment of impact of disasters such as photogrammetric methods, ground data collections, school awareness & safety assurance programme	

Assignments:

82. Name the government organizations related to disaster management & their role in pre, post & during disaster situation.
83. Mention the role of Civil Engineer in various disaster situations.
84. Explain the causes & types of earthquakes. Briefly explain the concept of plate tectonics in earthquakes.
85. Explain the phenomenon of Tsunami, briefly mentioning tsunami prediction tools.
86. Write a short note on cyclonic, flood, drought & fire disasters.
87. Explain the various components of disaster management cycle.
88. Briefly discuss various Disaster prevention & Risk assessment strategies.
89. Explain the advantages of usingScience & Technology for Disaster Management.
90. Briefly explain various medium used asDisaster Communication systems (Early Warning & its dissemination).
91. List out various rescue operation methods for various disasters.

Term Work:

1) Write case studies (any three– 03) on any disaster & disaster management techniques used covering topics mentioned below.
   (use imageries & site data if available to support your answer)
   a) Type & cause of disaster.
   b) Pre & Post disaster risk assessment.
   c) Disaster mitigation after the disaster.
   d) Use of Science & technology for various aspects of disasters.
   e) Emergency management (Use of any other tools or risk assessment strategies.
   f) Impact of disaster.
   g) Rehabilitation (pre-post disaster).
   h) Mention role of government agencies co-ordinating during disaster.

Text Books:

1) Srivastava H.M., Bhattacharya S.N., Gupta G.D., "Earthquakes Geography and Management", New Age International (P) Ltd., Publishers, New Delhi.
2) Singhal J.P., "Disaster Management", Laxmi Publications, New Delhi.
3) **K. Elangovan, "GIS: Fundamentals, Applications and Implementations", New India Publishing Agency, New Delhi.**

Reference Books:

1) Dr. Mrinali Pandey, "Disaster Management", Wiley India Pvt. Ltd.
2) Tushar Bhattacharya, "Disaster Science & Management", Mc Graw Hills (India), Pvt., Ltd.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 B : ADVANCED STEEL DESIGN

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50Marks	Termwork: 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1.	Strength of Materials
2.	Structural Design - I

Course Objectives:

	The student will able to design Building, Truss Bridge, Plate Girder and its foundation using Structural Steel

Course Outcomes:

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

1.	designthe member for different forces.
2.	design moment resisting connection.
3.	design plate girder

4.	design building frame
5.	design column foundation
6.	evaluate design forces for gantry girder and truss bridge.

UNIT - I	**Design of Structural Members:**	**(06Hours)**
	Design of Members for Axial Tension, Axial Compression, Shear and Bending Moment. Check for deflection.	
UNIT - II	**Design of Moment Resisting Connection:**	**(06Hours)**
	Design of bolted connection for Moment, Design of bolted connection for Moment, Design of connection for combined Shear and Moment.	
UNIT - III	**Design of Welded Plate Girder:**	**(06Hours)**
	Design of Cross section, Design of connection between web and flange, Design of Load carrying and Load bearing Stiffeners, Design of Intermediate Stiffeners, Design of Horizontal Stiffeners, Design of connection between stiffeners and section.	
UNIT - IV	**Design of Building Frame:**	**(06Hours)**
	Load Calculation, Analysis of Frame, Design of Beams, Design of Columns, Design of Beam to Beam connection, Design of Beam to Column connection.	
UNIT - V	**Design of Foundation:**	**(06Hours)**

	Design of Column base, base plate and anchor bolt, Design of RCC Footing.	
UNIT - VI	**Design Philosophy for different structures:**	**(06 Hours)**
	Design philosophy for Gantry Girder, Truss Bridges.	

Assignments:

92. Design of member for tension and compression.
93. Design of member for shear and moment
94. Design of bolted connection for moment
95. Design of welded connection for moment
96. Design of cross section for plate girder.
97. Design of stiffeners
98. Design of Beam to beam connection
99. Design of Beam to column connection
100. Draw layout of gantry girder or truss bridge.

Term Work: Design of any one project below-

1) Plate Girder
2) Building Frame

which includes-

17. Calculation of loads, Analysis and calculation of member forces
18. Design of different elements for member forces
19. Design of connections
20. Drawing Sheets using AutoCad.

Text Books:

19.	S. K Duggal, “Limit State Desin of Steel Structures”, Tata McGraw-Hill Education
20.	S.S.Bhavikatti, “Design of Steel Structures: By Limit State Method”, I K International Pub
21.	M. R. Shiyekar, “Limit State Design in Structural Steel”, Prentice-Hall of India
Reference Books:	
22.	N. Subhramanian, “ Design of Steel Structures”, Oxford University Press
23.	Dr. Ramchandra, “Limit State Design of Steel Structures”, Scientific Pub
24.	IS:800-2007, General Construction in Steel - Code of Practice”
25.	IS:875-1987, “Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)”
26.	SP-6(6)- 1972, “Handbook for Structural Engineers”

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 C :Solid Waste Management		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
Practical: 2Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50Marks	Termwork: 1Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Basic Knowledge of Physics, Chemistry and Mathematics
2.	Basic Knowledge of Environmental Science
3.	Basic Knowledge of Statistics and Computers
Course Objectives:	
	To learn the concept of Solid Waste Generation and understand its need and importance to Reuse, Recycle, Refuse and thereby, effectively manage the problem of Solid Waste generated as well as mitigation and combating the issue of land pollution.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Understand the generation, sources and characteristics of Solid Waste
2.	Classify the types of the collection and storage of Solid Waste
3.	Familiarize with the Present Scenario of transporting the Solid Waste by analyzing inefficient and Unscientific Manual Loading Of Waste and Understand the screening and scoping process and how it is applied
4.	Know the options for sorting the solid waste at Source, Waste Processing Site and Land filling Site
5.	Understand Site Investigation and Site Characterization for Landfill by Proper Planning And Design as well as Principles Of Composting by Manual And Mechanized Methods

6.	Familiarize with latest Emerging Processing Technologies for Solid Waste for Treatment and Recovery of useful Products	
UNIT - I	**Solid Waste Management**	**(6Hours)**
	Solid Waste: Definitions And Classification Of Solid Wastes, Composition, Characteristics And Quantities, Per Capita Quantity Of Municipal Solid Waste In Indian Urban Centers, Estimation Of Future Per Capita Waste Quantity, Physical Characteristics, Chemical Characteristics **Solid Waste Management**: Introduction, Objective, Principles, Functional Elements, Components, Solid Waste Generation, Environmental Impact Of Solid Waste Disposal On Land, Management System, Linkages Between Municipal Solid Waste Management System And Other Types Of Wastes Generated In An Urban Centre, Materials Flow Chart For Municipal Solid Waste, Legislation and Rules of SWM in India	
UNIT - II	**Collection and Storage of Waste**	**(6Hours)**
	Collection: Introduction, Present Scenario, Tools & Equipment, Methods Of Primary Collection Of Waste, Collection Of Waste From Shops And Establishments, Collection Of Bio-Medical Waste, Collection Of Hotel And Restaurant Waste, Collection Of Construction And Demolition, Collection Of Domestic Hazardous & Toxic Waste **Storage**: Introduction, Present Scenario, Storage Of Recyclable Waste, Provision Of Litter Bins On The Streets, Provision Of Special Containers For Storage Of Domestic Hazardous And Toxic Wastes, Measures To Be Taken By The Local Bodies Towards Segregation Of Recyclable Waste	
UNIT - III	**Transportation of Waste**	**(6Hours)**

	Introduction, The Present Scenario: Inefficient And Unscientific Manual Loading Of Waste Irregular Transportation, Underutilization Of Fleet Of Vehicles, Open Trucks Cause Nuisance, Non-Routing Of Transportation Of Waste From Hotels/Restaurants/Hospitals/Construction Site, Measures To Be Taken To Improve The System: Domestic/Trade/Institutional Waste, Routing Of Vehicles, Use Of Vehicles In Two Shifts, Type Of Vehicles To Be Used, Bio-Medical Waste From Hospitals/Nursing Homes/Health Care Establishments, Transportation Of Waste From Hotels & Restaurants, Transportation Of Construction Waste And Debris, Transportation Of Waste From Narrow Lanes, Setting Up Of Transfer Station, Lifting Of Waste From The Transfer Station, Workshop Facility For Vehicle Maintenance, Fleet Of Vehicles To Be Maintained, Parking Of Workshop Vehicles	
UNIT - IV	**Sorting and Material recovery**	**(6Hours)**
	Sorting: Introduction, Objectives, Stages, Primary and Secondary / Tertiary Sorting, Primary Sorting At Source, Primary Sorting At The Community Bin (Municipal Bin), Primary Sorting At Landfill, Secondary / Tertiary Sorting, Occupational Health, Toxicity Related Hazards, Hazardous Substance Containers, Household Batteries And Other Toxic, Infectious, Non-Recyclable, Problems And Desirable Change, Long-Term Desirable, Sorting At Waste Processing Site, Sorting Prior To Land filling **Material Recovery**: Introduction, Guidelines for Sorting for Materials Recovery, Material Recovery at the Source, Community Bin (Municipal Bin), Waste Storage Depot, Transfer Station, Intermediate Sorting at Central Sorting Facility, Waste Processing Site, Land filling Site	
UNIT - V	**Landfill and Composting**	**(6Hours)**

	Landfill: Introduction, Land filling Of Municipal Solid Waste, Environmental Impact And Its Minimization, Essential Components, Site Selection, Site Investigation And Site Characterization, Landfill Planning And Design, Design And Construction Of Landfill Liners, Construction And Operational Practice, Post-Closure Stabilization, Operation And Care, Landfill Quality Assurance And Quality Control, Land filling Costs, Manpower Requirements, Remediation Of Old Landfill Sites **Composting**: Introduction, Principles Of Composting – Manual And Mechanized Methods, Windrow Composting, Factors Affecting The Composting Process, Control Of Composting Process, Properties Of Compost, Mechanical Composting, Unit Processes, Environmental Control	
UNIT - VI	**Emerging Processing Technologies**	**(6 Hours)**
	Introduction, Vermicomposting, Biogas from Municipal Solid Wastes, Conversion Of Solid Wastes To Alcohol Fermentation, Pyrolysis, Plasma Arc Technology/Plasma Pyrolysis Vitrification, Refuse Derived Fuel, Hydro pulping, Slurry Carb Process, Treatment For Recovery Of Useful Products	
Assignments:		
1. Segregation and Storage of Waste at Source		
2. Abolish open waste storage depots and other Inefficient waste storage devices		
3. Public Private Partnership in SWM Services		
4. Private Sector Participation		
5. Provision of SWM Services in slums		
6. Allotment adequate funds for capital and revenue Expenditure for SWM		
Text Books:		

1. Handbook of Solid Waste Management, George Tchobanoglous and Frank Kreith, Second Edition, McGRAW-HILL
2. Solid Waste Management, K. Sasikumar, Sanoop Gopi Krishna, PHI Learning, 2009
3. Solid Waste: Engineering Principles and Management Issues, , George Tchobanoglous, 1st Edition, McGRAW-HILL
4. Solid Waste Technology and Management Vol. 1 and 2, Thomas Christensen, Wiley Publishing, 2010
5. Solid Waste Management, Stefen Burnley, Wiley Publishing, 2014

Reference Books and Further Reading:

1. Assessment of the Status of Municipal Solid Waste Management in Metro Cities, State Capitals, Class I Cities and Class II Towns in India: An Insight .Sunil Kumar, J.K. Bhattacharya, A.N. Vaidya, TapanChakrabarti, SukumarDevotta, A.B. Akolkar. Kolkatta : Central Pollution Control Board (CPCB), National Environmental Engineering Research Institute (NEERI), 2008.
2. Ministry of New and Renewable Energy, MNRE. National Master Plan for Development of Waste-to-Energy in India. Ministry of Environment and Forests. [Online] 2003.
3. Census of India, 2011. Census of India. [Online] 2011.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 D: Entrepreneurship Development		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Project Management
2.	Construction Management
3.	Engineering Economics and Financial Management
4.	Construction Techniques and Machinery
Course Objectives:	
	The purpose of this course is to generate a new breed of entrepreneurs on an ongoing basis. This course will create in them the necessary knowledge, attitudes, skills and competence to start and manage a new enterprise. It will also train them to be innovative in creating and managing business units started by them and manage change.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	develop the ability to select potential areas for self-employment

2.	identify information and use of technology for Business Initiatives.
3.	understand the use of technology to design and structure the organization
4.	select appropriate agency/ies for technical and financial support.
5.	prepare preliminary and detailed project report.
6.	manage sales and sales promotion.

UNIT - I	**Introduction to Entrepreneurship**	**(Hours)**
	Definition entrepreneurship and enterprise, Concept, Classification & Characteristics of Entrepreneur,need and scope of entrepreneurship in Civil Engineering, Entrepreneurship as career, present scenario of with respect to entrepreneurship in India.	**06**
UNIT - II	**Business Opportunity Identification**	**(Hours)**
	Opportunity search : Divergent Thinking Mode : Meaning and Objectives – Tools and Techniques : Environmental Scanning for business opportunity identification Opportunity Selection : Convergent Thinking Mode : Tools and Techniques	**06**
UNIT - III	**Business Plan**	**(Hours)**

	Meaning and Importance – Objectives – Selections Contents – Marketing and Technical Feasibility – Financial Viability market survey techniques, marketing viability of the product, and typical areas of Civil Engineering.	**06**
UNIT - IV	**Finance and accountancy**	**(Hours)**
	Finance and accountancy: working capital and fixed capital assessment incentives from financial institutions and government, financial ratios, their significance,break even analysis cash flow charts financial statements.	**06**
UNIT - V	**Project Report**	**(Hours)**
	Project report: Preliminary and final project report preparation, financial technical commercial and economic viability project implementation process project profiles with respect to Civil Engineering	**06**
UNIT - VI	**Marketing Management**	**(Hours)**
	Introduction to marketing management, contract management and sales promotion.Motivation risk and its analysis goal settingdecision making. Communication skills effective communication and barriers.	**06**

Assignments:	
101.	Case study for Present scenario of Entrepreneurship development in India.
102.	Assignment based on business plan preparation.
103.	Develop a market survey format and carry out a market survey.
104.	Prepare financial report of any constrction project.
105.	Prepare a project report for any small construction project
106.	Prepare marketing proposal for a construction project.

107. Study of any one of Entrepreneure biography.	
108. Student are expected to study the assistance scheme of the following Institutions District Industries Center (DIC) Maharashtra Center for Entrepreneurship Development (MCED) National Small Industries Corporation of India (NSIC) Maharashtra Industrial Development Corporation (MIDC) Micro Small and Medium Enterprises (MSME)	
Term Work:	
21. Visit report :Shudent shall visit a small scale industry, study the working of the industry and write a report on that.	
22. Prepare a detailed report for construction industry.	
23.	
Text /Reference Books:	
1. Small Scale Industry Handbook – Jay Narayan Vyas, Published by Granthvitaran, Ahmedabad	
2. Entrepreneurship for the Nineties – Gordon B. Baty published by Prentice Hall Inc. College Technical Reference by Granthvitaran	
3. Self-made Impact making Entrepreneurs – published by Entrepreneurship Development, Institute of India Bhatt. P.O. Chandkhed, Dist. – Gandhinagar	
4. Entrepreneurship : New venture creation by David Holt Prentice Hall of India Pvt. Ltd. Latest Edition	
5. Entrepreneurs Talent Temperament Technique by Bill Bolton and John Thompson- 2nd Edition- Elsevier	
6. Dynamics of Entrepreneurship Development – Vasant Desai.	
7. Innovation and Entrepreneurship – Peter F. Drucker	
Syllabus for Unit Test:	

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 E :Hydraulic Structures

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3Hours / Week	End Semester Examination: 60 Marks	Theory: 3Credits
Practical: -2 Hours /Week	Continuous Assessment: 40 Marks	
Tutorial: --	Term Work and Oral: --Marks	Term work:1Credit

Course Pre-requisites:

The Students should have knowledge of

1.	Fluid and Soil Mechanics
2.	Water Resources Engineering

Course Objectives:

	Students will study uses and design hydraulic structures.

Course Outcomes:

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

1.	Describe and design weirs on permeable foundations
2.	Design channels by different methods.
3.	Describe various types of canal outlets and regulation works
4.	Describe and design cross drainage works
5.	Describe and design river training works .
6.	Describe causes , effects and measures to control water logging.

UNIT – I	**Diversion Head works**	**(06Hours)**
	Introduction, types, components, weir and barrage, causes of failure of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, silt control devices.	

UNIT – II	**Canals**	**(06Hours)**
	Introduction, Classification of irrigation canals, canal network, canal alignment, losses in channels, design of unlined channels by silt theories, Kennedy's and Lacey's theory, tractive force theory, losses in channels, Lining of channels types and economics.	
UNIT – III	**Canal outlets and regulation works**	**(06Hours)**
	Introduction , requirements of good outlets, types of outlets, Canal regulation works, necessity and location of falls, types of falls, cross regulator and distributary head regulator.	
UNIT – IV	**Cross drainage works**	**(06Hours)**
	Introduction, types, classification of aqueducts and siphon aqueducts, design of cross drainage works, determination of maximum flood discharge, determination of waterway of drain	
UNIT – V	**River training works**	**(06hours)**
	River training and its objectives, classification of river training works, Marginal embankment or levees, guide banks, spurs , types of spurs, design of guide banks and spurs.	
UNIT – VI	**Water logging and its control**	**(06 Hours)**
	Introduction ,causes and effects of water logging, measures for prevention of water logging, open and closed drains, reclamation of saline and alkali soils.	
Assignments:		
109.	Problems on Bligh's and Khosla's theory	
110.	Design problems on Kennedy's and Lacey's theory.	

111.	Design of any one type of fall
112.	Design of head regulator
113.	Design of aqueduct/ siphon aqueduct.
114.	Design of guide banks /spurs.
115.	Case studies on uses of spurs
116.	Case studies on drainage of water logged areas
Text Books:	
22. Dr. P.N. Modi "Irrigation Water Resources and Water Power Engineering " , Standard Book House.2014	
23. S. K. Garg "Irrigation Water Resources and Water Power Engineering" Khanna Publishers, 2006.	
Reference Books:	
27.	Garde R.J. and Rangaraju K.G. ," Sediment transport and river Engineering" New Age International Publishers, 2006
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 F: SOCIAL AND LEGAL ASPECTS IN CIVIL ENGINEERING

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3Hours / Week	End Semester Examination: 60 Marks	Theory: 3Credits
Practical: 2Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50Marks	Termwork: 1Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Building Planning Design and Byelaws.
2.	Project Management.
Course Objectives:	
	To make students understand applications of social and legal aspects in civil engineering construction and professional practice.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Forms of business associations, their liabilities and their governing principles.
2.	To understand difference between executional policies of public and private projects, types of organization structures & their bidding processes.
3.	To understand laws of contracts, contract classification, types of agreements, safety legislation, health laws

4.	Interprete contracts, understand conflict resolution, performance disputes, arbitration etc.	
5.	Learn social aspects like neighboring land owner rights, byelaws regarding growth & control, environmental aspects etc.	
6.	Understand intellectual property rights related to patents, copyrights & trade secrets.	
UNIT - I	**Title- : FORMS OF BUSINESS ASSOCIATION & EMPLOYMENT**	**(6 Hours)**
	Sole proprietorship, Partnerships, authority & liability of partners, Profit corporations & non-profit corporations, Professional corporations, Limited Liability Partnerships (LLP), Limited liability companies (LLC), Joint Ventures. Agency & employment - Policies behind agency concept & relationship, Employment relationship & workers compensation, Union & labour disr**u**ptions, Independent contractors, Labour laws - overview	
UNIT - II	**PROJECT ORGANISATIONS**	**(6 Hours)**
	Public versus Private projects, Pricing types & delivery schedules. Turnkey Contractors- design & build project alliance, Public Private Partnerships (PPP), Build Operate & Transfer (BOT), Building Information Modeling (BIM), Competitive bidding process, Lean project delivery	
UNIT - III	**CONTRACTS & CONSTRUCTION PROCESS**	**(6 Hours)**
	Contract formation, defects in contract formation, contract classification. Agreements- Memorandum of Understanding (MoU), Letter of Intent	

	(LoI), Breach of contract, remedies for contract breach, limits on recovery, Law of Tort, Limits on tort liability. Basic types of contracts, Public versus Private owner, Prime contractor, Sub-contractor. Purchase orders, Insurers, sureties, Permits, Building codes, safety legislation, Occupational safety & health laws, Responsibility of consultant, professional standard & compliance, ownership of drawings & specifications. Suspension, abandonment & termination clauses.	
UNIT - IV	**PERFORMANCE DISPUTES**	**(6 Hours)**
	Contract interpretation, contractor claims, owner claims, contractor defenses to claims, resolving conflicts and inconsistencies, differing conditions, changes, design liability, Project delays and accelerations, time & duration of extension, notices, Warranty (Guarantee) clauses, bonus/penalty clauses, Contractual indemnity, Insurance, Arbitration, mediation & dispute resolution, Termination of contract.	
UNIT - V	**SOCIAL ASPECTS & ENVIRONMENTAL LAWS**	**(6 Hours)**
	Urban & rural social transformation and their impact on social life, Housing as social security and important land use component, role of housing in development of family & community wellbeing, Land use provisions, economic concepts of land pricing, demand forecasting for land use, factors affecting land supply and demand. Environment restrictions & limitations on land use control. Historic & landmark preservation. Open space & National Environmental Policy act. Resource conservation & recovery act. Clean water & clean air act. The environment friendly design and construction.	
UNIT - VI	**INTELLECTUAL PROPERTY RIGHTS**	**(6 Hours)**

	Ideas, Copy rights, Patents & Trade secrets Nature of Intellectual property - Patents, Designs, Trademarks & copyrights, availability of legal protection, duration of protection. Process of patenting & development for Technological Research, Innovation, Patent rights, Licensing & Transfer of Technology, Patent information and data base.	

Assignments:

1. Distinguish between forms of business associations, their liabilities and their governing principles.
2. Explain the policies of public and private projects, types of organization structures & their bidding processes.
3. Short note on Turnkey Contractors- design & build project alliance
4. Explain Laws of contracts, contract classification.
5. Documentation in contract formation, defects in contract formation
6. Short note on Arbitration, mediation & dispute resolution.
7. List various social laws and explain Historic & landmarkpreservation
8. Explain land zoning – Byelaws for landuse control.
9. Explain in brief Intellectual property,Patents-Designs, Trademarks & copyrights
10. Explain with flow chart Process of patenting.

Term Work:

1) Collection And analysis of data for different business association.
2) Application of Building Information Modeling (BIM).
3) Classification of contracts.
4.) Case study on arbitration.
5.) Different types of laws related to property and environment.

6.) Application of intellectual property rights.
7)Write case study on: Build Operate & Transfer (BOT), Public PrivatePartnerships (PPP)
Text Books:
• BIM and construction management Brad Hardin,DaveMccool.
• Fundamentals of Engineering Economics-Pravin Kumar, Wiley, India.
Reference Books:
• BIM and construction management Brad Hardin,DaveMccool. • PrabuddhaGanguly, “Intellectual Property Rights”,Tata Mc-Graw Hill. • Fundamentals of Engineering Economics-Pravin Kumar, Wiley, India. • Arbitration, Conciliation and Alternative Dispute Resolution Systems- Dr S.R. Myneni-2004 Edition, reprinted in 2005 –Asia Law House Publishers. • The Indian Contract Act (9 of 1872) Bare Act-2006-Professional Book Publishers.

Syllabus for Unit Test	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 G: Advanced Engineering Geology With Rock Mechanics		
TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDITS ALLOTTED**
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Term work: 01 Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Applied Geology
2.	Basic Science
Course Objectives:	
	To make students understand strength and water tightness of rocks, treatments given to the rocks. Decide foundation level for dams, bridges and alignment of tunnel.
Course Outcomes:	
On completion of the course, students will be able to:	
1.	Discuss engineering geology of Deccan trap basalt.
2.	To determine occurrence of ground water.
3.	. Explain tail channel erosion.
4.	Decide alignment of tunnel with reference to nature and structure of rock
5.	Discuss process of soil formation
6.	Decide different treatment to tunnel and foundation of civil engineering structures using rock mechanics.

UNIT - I	**Introduction and Engineering geology of the Deccan Trap**	**(6 Hours)**
	Importance of geological studies in engineering investigation, Precautions necessary to avoid misleading conclusions likely to be drawn while interpreting drilling data with particular reference to RQD. .Case histories illustrating economics made possible by proper geological	

	studies and wasteful expenditure or difficulties resulting from their neglect. Engineering characters of rocks of major rock formations of India. **Engineering geology of the Deccan Trap Basalts:** Stratigraphy of Maharashtra**, Varieties** of Basalt, Field Characters of flows, regional distribution of Deccan trap rocks. Factors affecting strength and water tightness, Stability of cuts and ability to stand without support. Significance of commonly occurring features like gas cavities, Jointing, Weathering, Hydrothermal alteration, Volcanic breccias, Tachylytes, Dykes, Fractures.	
UNIT - II	**Deccan Trap Basalt as Construction material and Ground water conditions in Maharashtra**	**(6 Hours)**
	Deccan trap basalt as construction material, Use of compact basalt and amygdaloidal basalt as rubble for masonry and metal for concrete. Ground water conditions in Maharashtra with reference to Deccan trap area. Water bearing characters of different types of basalt, volcanic Breccia's, Tachylytic basalt, Dykes, Fractures, Weathering products and older alluvium. Geological factors governing natural recharge. Geological aspects of multi aquifer system. Geological aspects of conservation of water and artificial recharge. Dependence of success of such schemes as percolation tanks and water shed development on geological conditions and necessity of geological studies for such schemes. Study of case history.	
UNIT – III	**Dam, Foundation Treatment, Tail Channel & Geomorphology.**	**(6 Hours)**

	Dams: Strength and Water tightness of Deccan Trap rocks from foundation point of view. Physical properties such as compressive strength, Water absorption .Effect of weathering and hydrothermal alteration on the engineering properties of rocks. Deterioration of rock masses on exposure to the atmosphere and suitable treatment for such rocks. **Foundation Treatment:** Determining of foundation levels of gravity dams and cut off levels for earth dams. Correction of adverse features by means of grouting, Consolidation grouting for improving strength of weak and fragmented rocks. Curtain grouting for preventing leakage through foundation rocks. Foundation Treatment for fractures, jointed rocks Tachylytes , faults and dykes. **Tail Channels:** Erosion of tail channel as a factor in selecting site for spillway .Causes of rapid erosion of tail channels of side spillways. Geological conditions leading to tail channel erosion, case histories. Suitable treatment. **Geomorphology:** Geomorphologic Studies for Reservoir, Different parameters of geomorphology, stream order, stream length, drainage pattern, drainage density and bifurcation ratio etc., Application of these studies.	
UNIT - IV	**Tunnel and Bridges**	**(6 Hours)**
	Preliminary geological investigation for different types of tunnels, Difference in behavior of basalts because of jointing as exemplified by compact basalt and amygdaloidal basalt, Difficulties introduced by tachylytes, Volcanic breccias, Tuffs, fractures, Dykes, Hydrothermal alteration, Investigation for bridge foundations,. Computing safe bearing capacity (SBC) for bridge foundation based on nature and structures of rocks. Foundation settlements, Case histories.	
UNIT - V	**Geology of Soil formation**	**(6 Hours)**

	Residual and transported soil. Rock weathering conditions favorable for decomposition and disintegration. Influence of climate on residual and transported soil in Deccan trap area. Nature of alluvium of Deccan traps rivers and its engineering characters. Effect of decomposition of calcium carbonate. Scarcity of sand in the river in Deccan traps area. Geophysical Investigations: Electrical resistively methods of exploration as applied to engineering investigation.	
UNIT - VI	**Rock Mechanics**	**(6 Hours)**
	General principals of rock mechanics, physical and mechanical properties of Deccan trap rocks. Calculating RQD, Joint frequency index, RMR, RSR, Q-system, standup time calculations, Bieniawski's geomechanical classifications and Bickhems Rock Classification.	

Assignments:
117. Identification of Varieties of Deccan Trap Rocks.
118. Various Foundation Treatments.
119. Tunneling in Hard Rock
120. Tunneling in Soft Rock
121. Basalt as construction Material.
122. Calculation of RQD and RMR.
123. Types of Drainage Pattern with studies of streams.
124. Study of Toposheet (Any One for Geomorphology)
125. Calculation of Geomorphological Parameters as per the requirement of Reservoir estimation.
126. Weathering and Soil formation.
Term Work:
1. Construction of Geological section for dam site using drilling data.
2. Construction of Geological section and locating fault by angle holes.

3. Construction of Geological section and limitation for drilling.
4. Dams on Deccan trap rocks.
5. Tunnels and road cuts in folded sedimentary rocks.
6. Tunneling in Deccan trap rocks.
7. A report to be prepared on actual site visit for Major Civil Engineering Structures.

Text Books:

- Engineering Geology by Dr. .R.B. Gupte.PVG Pune
- Engineering and general Geology by Parbin Singh.
- General and Engineering Geology by Dr P. T. Sawant, New Delhi Publication.

Reference Books:

- Bartons, N.Lien,R.and Lunde, J.1974,"Engineering classification of Rock masses for the Design of Tunnel Support", Rock Mech.vol.6,No.4.
- Bieniawski Z.T1973,"Engieering classification of jointed rocks Masses",Trans.S African Instn.,Civil Engineers.,Vol.15,NO.12,p.p3354-344.
- Bieniawaski Z.T.1988,"Rock Mass Rating System In Egineering Practice-Symp on Rock classification Systems for Engineering Purposes ASTM",STP 984, PP1734.
- Gupte.R.B (1994),"PWD, Hand –book chapter-6 Part II Engineering Geology Government of Maharashtra."
- Goodman: Rock Mechanics.

Syllabus for Unit Test	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 H: Development Engineering		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Surveying and Advanced Surveying
2.	Engineering Economics
Course Objectives:	
	To give exposure and insight on governance and development problems particularly at rural level and to develop new, innovative methods and solutions to existing problems in rural areas.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	The students can take hands on research on real world problems and deliver solutions.
2.	develop multi scaled perspective about decisionsin the built environment
3.	expose the students to the analysis and evaluation of real world problems aiming to bring desired change in the society.

4.	understand the government policies
5.	understand the various government schemes
6.	Describe importance of people participation in development projects.

UNIT - I	**Introduction to Development Engineering**	**(06 Hours)**
	Need of development at rural level, development deficit, socioeconomic development, issues and challenges associated with drinking water, waste water treatment, electricity, public transport, irrigation, Sanitation and non-conventional energy sources. National and state level policy.	
UNIT - II	**Initiatives of GOI and Maharashtra State**	**(06 Hours)**
	Initiatives of GOI and Maharashtra State Various schemes for Rural Area like Jalyuktashivar, SansadAdarsh Gram Yojana, Model village or Smart village concept, PMGSY,CMGSY, Unnat Bharat Abhiyan, Unnat Maharashtra Abhiyan, and other schemes for rural areas. Water shed development projects.	
UNIT - III	**Life cycle costing of various schemes**	**(06 Hours)**
	Life cycle costing of various schemes Different phases in the schemes and projects, cost benefit analysis, environmental analysis of the project.	
UNIT - IV	**Field work and reporting**	**(06 Hours)**
	Field work and reporting Primary data gathering tools such as Delphi methods and other methods, Assessment of existing schemes in ruralarea and possible problem identifications in existing scheme	
UNIT - V	**Geographic Information Systems (GIS)**	**(06 Hours)**

	Introduction to Geographic Information Systems (GIS), Advantages and benefits, various GIS software's, Interdisciplinary applications of GIS, Integrated use of GIS with GPS and remote sensing, mapping and preparation of layouts.	
UNIT - VI	**Social Impact Assessment**	**(06 Hours)**
	PRA, RRA. The basics of PRA-The Demand side: House hold surveys, Drinking water and irrigation water. The supply side: Resource map, assets, institutions and allocation documents, time line, changes in crop and welfare.	

Assignments:	
127.	Assignment based on challenges associated with drinking water
128.	Assignment based on challenges associated with waste water
129.	Assignment based on challenges associated with public transport
130.	Assignment based on challenges associated with sanitation
131.	Assignment based on initiatives by GOI and Govt. of Maharashtra for development
132.	Assignment based on activities under Unnat Maharashtra and Unnat Bharat Abhiyan
133.	Assignment based on assessment of existing schemes in rural area.
134.	Assignment based on use of GIS in development process of rural area
135.	Assignment based on PRA & RRA

Termwork:

1. Study of any one development project from urban area in progress
2. Visit report of any one development project in rural area in progress
3. Impact assessment of development projects
4. Use of GIS for development project

5. Cost benefit analysis of development project	
Text Books / Reference Books:	
28. Geographic Information Systems and Science, Second Edition 2005: Longley, Paul A., Michael F. Goodchild, David J. Maguire, David W. Rhind, John Wiley & Sons, New York.	
29. Chand, M. and Puri, U.K.(1983),'Regional Planning in India', Allied Publishers, New Delhi.	
30. Kaiser, E. J., et.al. (1995), 'Urban Landuse Planning', 4th(ed) Urbana, University of Illinois Press.	
31. Sundaram, K.V. 1985 'Geography & Planning', Concept Publishing Co., New Delhi.	
32. Desai, V. (2005), 'Rural Development of India', Himalaya publishing house, Mumbai.	
33. Rau, S.K. (2001), 'Global Search for Rural Development', NIRD, Hyderabad.	
34. Longley, P. A., Michael F. Goodchild, Maguire, D.J., Rhind, D. W. (2005), 'Geographic Information Systems and Science', Second Edition 2005: John Wiley & Sons, New York.	
Syllabus for Unit Test:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

55: Project Stage II		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Practical: 06 Hours / Week	Term Work and Oral: 100 Marks	Termwork: 08 Credit

Course Pre-requisites:	
The Students should have knowledge of	
1.	Engineering Mathematics
2.	Written and Communication skills
3.	Analytical skills
4.	Project planning and design
5.	
Course Objectives:	
	The student shall be able to identify the problem and suitable solution for the same.
Course Outcomes:	
On completion of the course, the students will be able to:	
1.	Design the experimentation for the work.

2.	Analyse the results of the work	
3.	Decide the conclusion and suggestions for the work.	
UNIT - I	**Stage-II**	
	The Project Stage-II will be the work in continuation of Project Stage-I.No change on the topic of Stage-I is allowed. **Stage-II:** It consists of completing the experimentation/design/model work of the problem/ topic defined in Stage-I. Preparing a detailed project report in specified format. The report shall be consisting of work completed in Stage-I, observations, results and conclusions of the problem/topic selected. **Oral** : Oral shall be based on above termwork and a presentation on it.	