JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. CIVIL ENGINEERING (REGULAR)

COURSE STRUCTURE (w.e.f 2018-19)

R-18

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Linear Algebra and Calculus	3	1	0	4
2	BSC	Physics	3	1	0	4
3	ESC	Programming for Problem Solving	3	0	0	3
4	ESC	Engineering Graphics	1	0	4	3
5	BSC	Physics Lab	0	0	3	1.5
6	ESC	Programming for Problem Solving (Lab)	0	0	3	1.5
		Total Credits				**17**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Ordinary Differential Equations and Multivariable Calculus	3	1	0	4
2	BSC	Chemistry	3	1	0	4
3	ESC	Engineering Mechanics	3	1	0	4
4	ESC	Workshop	1	0	3	2.5
5	HSMC	English	2	0	0	2
6	BSC	Chemistry Lab	0	0	3	1.5
7	HSMC	English Lab	0	0	2	1
		Total Credits				**19**

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COURSE STRUCTURE (w.e.f 2018-19)

R-18

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PCC-1	Building Materials, Construction and Planning	3	0	0	3
2	PCC-2	Engineering Geology	2	0	0	2
3	PCC-3	Strength of Materials-I	3	1	0	4
4	BSC	Probability and Statistics	3	1	0	4
5	PCC-4	Fluid Mechanics	3	1	0	4
6	ESCLCE-CE	Computer aided Civil Engineering Drawing	0	0	3	1.5
7	LC-CE-1	Strength of Materials Lab	0	0	3	1.5
8	LC-CE-2	Engineering Geology lab	0	0	2	1
		Total Credits				**21**

II YEAR II SEMESTER

S.No	Course Code	Course Title	L	T	P	Credits
1	ESC	Basics of Electrical & Electronics Engineering	3	0	0	3
2	ESC	Basics of Mechanical Engineering	2	0	0	2
3	PCC-5	Surveying &Geomatics	3	0	0	3
4	PCC-6	Strength of Materials-II	3	0	0	3
5	PCC-7	Hydraulics and Hydraulic Machinery	3	0	0	3
6	PCC-8	Structural Analysis -I	3	0	0	3
6	LC-CE-3	Surveying Lab	1	0	2	2
8	ESCLCE-CE	Basic Electrical & Electronics Lab	0	0	2	1
9	LC-CE-4	Fluid Mechanics & Hydraulic Machinery Lab	0	0	2	1
		Total Credits				**21**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. CIVIL ENGINEERING (REGULAR)

COURSE STRUCTURE (w.e.f 2018-19)
R-18

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P/D	Credits
1	PCC-9	Structural Analysis-II	3	0	0	3
2	PCC-10	Geotechnical Engineering	3	0	0	3
3	PCC-11	Structural Engineering –I**(RCC)**	3	0	2	4
4	PCC-12	Transportation Engineering	3	0	0	3
5	PEC-1	Professional Elective	3	0	0	3
6	HSMC	Engineering Economics and Accounting	2	0	0	2
7	LC-CE-5	Highway Engineering and Concrete Technology Lab	0	0	3	1.5
8	LC-CE-6	Geotechnical Engineering Lab	0	0	3	1.5
9	HSMC LC-CE	**Advanced Communications Lab ******	0	0	2	1.0
		Total Credits				**22**

III YEAR II SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	PCC-13	Environmental Engineering	3	0	0	3
2	PCC-14	Foundation Engineering	3	0	0	3
3	PCC-15	Structural Engineering –II**(Steel)**	3	0	2	4
4	PCC-16	Hydrology & Water Resources Engineering	3	1	0	4
5	PEC-2	Professional Elective	3	0	0	3
6	OEC	Open Elective –I	3	0	0	3
7	LC-CE-7	Environmental Engineering Lab	0	0	2	1
8	LC-CE-8	Computer Aided Design Lab	0	0	2	1
		Total Credits				**22**

COURSE STRUCTURE (w.e.f 2018-19)

R-18

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PCC-17	Estimation, Costing and Project Management	3	1	0	4
2	PEC-3	Professional Elective	3	0	0	3
3	PEC-4	Professional Elective	3	0	0	3
4	OEC	Open Elective –II	3	0	0	3
5	HMSC	Professional Practice law & Ethics	2	0	0	2
7	MINI	Mini Project/Internship**(It will be initiated after 3rd year and will be completed during summer vacation but the exam will be conducted in this semester)**	0	0	4	2
8	PROJ	Project Stage-I	0	0	6	3
9	Seminar	Seminar	0	0	2	1
		Total Credits				**21**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PEC-5	Professional Elective	3	0	0	3
2	PEC-6	Professional Elective	3	0	0	3
3	OEC	Open Elective –III	3	0	0	3
4	PROJ	Project Stage-II	0	0	16	8
		Total Credits				**17**

Professional Elective -I

1. Concrete Technology
2. Finite Element Methods for Civil Engineering
3. Earthquake Engineering
4. Introduction To Offshore Structures

Professional Elective -II

1. Pre-stressed Concrete
2. Bridge Engineering
3. Optimization techniques in structural engineering
4. Introduction to Composite Materials

Professional Elective -III

1. Ports & Harbor Engineering
2. Design & Drawing of Irrigation Structures
3. Ground Water Development & Management
4. Stochastic Hydrology

Professional Elective -IV

1. Geo-environmental Engineering
2. Environmental Engineering -II

Professional Elective -V

1. Pavement Design
2. Traffic Engineering
3. Urban transportation engineering

Professional Elective -VI

1. Ground Improvement Techniques
2. Soil Dynamics & Machine Foundations
3. Advanced foundation Engineering
4. Geo techniques for Infrastructure

Open Elective –I

1. Remote Sensing & Geographical Information Systems
2. Disaster Management
3. Nano Technology
4. Construction Management

Open Elective –II

1. Project Management
2. Elements of Earthquake Engineering
3. Construction Technology & Management
4. Air Pollution & Control

Open Elective –III

1. Waste Management
2. PERT & CPM
3. Finite Element Methods
4. Environmental Impact Assessment

Open Elective –I

1. Remote Sensing & Geographical Information Systems
2. Disaster Management
3. Nano Technology
4. Construction Management

Open Elective –II

1. Project Management
2. Elements of Earthquake Engineering
3. Construction Technology & Management
4. Air Pollution & Control

Open Elective –III

1. Waste Management
2. PERT & CPM
3. Finite Element Methods
4. Environmental Impact Assessment

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. I-Sem

L	T	P	C
3	0	0	3

BUILDING MATERIALS, CONSTRUCTION AND PLANNING

Pre Requisites: Engineering Mechanics

Course Objectives: the objectives of the course is to
- **List** the construction material.
- **Explain** different construction techniques
- **Understand** the building bye-laws
- **Highlight the**smart building materials

UNIT - I

Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing.

Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics.

Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminum, Plastics.

UNIT – II
Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests.
Admixtures – mineral & chemical admixtures – uses.

UNIT - III
Building Components : Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ; foundations – types ; Damp Proof Course ; Joinery – doors – windows – materials – types.
Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Harzards – Classification of fire resistant materials and constructions

UNIT - IV
Mortars, Masonry and Finishing's
Mortars: Lime and Cement Mortars
Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.
Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.
Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT – V

Building Planning: Principles of Building Planning, Classification of buildings and Building by laws.

Course Outcomes
After the completion of the course student should be able to
- **Define** the Basic terminology that is used in the industry
- **Categorize** different building materials , properties and their uses
- **Understand** the Prevention of damage measures and good workmanship
- **Explain** different building services

TEXT BOOKS:

1. Building Materials and Construction – Arora &Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

REFERENCES:

1. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
2. Building Materials by Duggal, New Age International.
3. Building Materials by P. C. Varghese, PHI.
4. Building Construction by PC Varghese PHI.
5. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
6. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. I-Sem	L T P C
	2 0 0 2

ENGINEERING GEOLOGY

Pre Requisites: Building Materials

Course Objectives: The objective of this Course is
- To give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology, Geological Hazardous and Environmental Geology
- To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Planning and construction of major Civil Engineering projects

UNIT - I
Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.
Weathering of Rocks : Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like "Granite"

UNIT - II
Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartiz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite , Magnetite, Chrorite , Galena , Pyrolusite, Graphite, Magnesite, and Bauxite.
Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laerite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III
Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults uncomfornities, and joints - their important types and case

studies. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilisation of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

UNIT - IV
Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

UNIT - V
Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

Course Outcomes: At the end of the course, the student will be able to:
- Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice
- The fundamentals of the engineering properties of Earth materials and fluids.
- Rock mass characterization and the mechanics of planar rock slides and topples

TEXT BOOKS:
1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014

REFERENCES:
1. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
2. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications
3. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
4. Krynine& Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
5. Engineering Geology by SubinoyGangopadhyay, Oxford university press.
6. Engineering Geology for Civil Engineers – P.C. Varghese PHI

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**

                                                       3   1   0   4

STRENGTH OF MATERIALS - I

Pre Requisites: Engineer Mechanics

Course Objectives: The objective of this Course is
- To understand the nature of stresses developed in simple geometries such as bars, cantilevers and beams for various types of simple loads
- To calculate the elastic deformation occurring in simple members for different
   types of loading.
- To show the plane stress transformation with a particular coordinate system for different orientation of the plane.
- To know different failure theories adopted in designing of structural members

UNIT – I
SIMPLE STRESSES AND STRAINS:
Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic modulii, Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.
STRAIN ENERGY – Resilience – Gradual, sudden, and impact loadings – simple applications.

UNIT – II
SHEAR FORCE AND BENDING MOMENT:
Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III
FLEXURAL STRESSES:
Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangularand circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES:
Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections.

UNIT – IV
DEFLECTION OF BEAMS:
Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for

cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load and couple -Mohr's theorems – Moment area method – Application to simple cases.

CONJUGATE BEAM METHOD: Introduction – Concept of conjugate beam method - Difference between a real beam and a conjugate beam - Deflections of determinate beams with constant and different moments of inertia.

UNIT – V
PRINCIPAL STRESSES:
Introduction – Stresses on an oblique plane of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear –Principal stresses – Mohr's circle of stresses – ellipse of stress - Analytical and graphical solutions.

THEORIES OF FAILURE: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory- Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

Course Outcome:
On completion of the course, the student will be able to:
- Describe the concepts and principles, understand the theory of elasticity includingstrain/displacement and Hooke's law relationships; and perform calculations, related tothe strength of structured and mechanical components.
- Recognize various types loadsapplied on structural components of simple framing geometries and understand the nature of internalstresses that will develop within the components.
- to evaluate the strains and deformation that will result due to theelastic stresses developed within the materials for simple types of loading
- Analyze various situations involving structural members subjected to plane stressesby application of Mohr's circle of stress;
- Frame an idea to design a system, component, or process

TEXT BOOKS:
1) Strength of Materials by R.K Rajput, S.Chand& Company Ltd.
2) Mechanics of Materials by Dr.B.CPunmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain

REFERENCES:
1) Strength of Materials by R. Subramanian, Oxford University Press
2) Mechanics of material by R.C.Hibbeler, Printice Hall publications
3) Engineering Mechanics of Solids by EgorP.Popov,Printice Hall publications
4) Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
5) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.
6) Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press

II Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
                                                          3   1   0   4

PROBABILITY AND STATISTICS

Pre Requisites: Mathematic - I

Objectives: To make the student to understand the statistics and probability theories such as random variables, sampling distribution, tests of significance etc. so that he can apply them to engineering problems.

Outcomes: Students will able to perform probability theories & statistics on engineering problems

UNIT-I: Probability
Sample space and events – Probabilty – The axioms of probability – Some Elementary theorems – Conditional probability – Baye,s theorem, Random variables – Discrete and continuous**.**

UNIT-II: Single Random variables and probability distributions

Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution . Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution.
Binomial , Poisson & normal distributions and their properties . Moment generating functions of the above three distributions. and hence finding the mean and variance.

UNIT-III: Multiple Random variables, Correlation&Regression
Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation -Coefficient of correlation, The rank correlation.
 Regression- Regression Coefficient, The lines of regression and multiple correlation & regression.

UNIT-IV: Sampling Distributions and Testing of Hypothesis
Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and varience, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of varience.
Parameter estimations – likelihood estimate, interval estimations .
Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, Two sided test,

Large sample tests:

　　(i)Test of Equality of means of two samples equality of sample mean and population mean (cases of known varience& unknown varience, equal and unequal variances)

　　(ii) Tests of significance of difference between sample S.D and population S.D.

　　(iii)Tests of significance difference between sample proportion and population proportion&difference between two sample proportions.

Small sample tests:

Student t-distribution,its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples

Snedecor's F- distribution and it's properties. Test of equality of two population variences

Chi-square distribution , it's properties, Chi-square test of goodness of fit

UNIT- V:Queuing Theory & Stochastic Processes

Arrival Theorem – Pure Birth process and Death process M/M/1 Model. Introduction to Stochastic Processes – Markov process classification of states – Examples of Markov Chains, Stochastic Matrix, limiting probabilities.

Text Books:

1) FUNDAMENTALS OF MATHEMATICAL STATISTICS BY S C GUPTA AND V.K.KAPOOR
2) PROBABILITY AND STATISTICS FOR ENGINEERING AND THE SCIENCEC BY JAY L.DEVORE.

References:

1) MATHEMATICS FOR ENGINEERS SERIES –PROBABILITY STATISTICS AND STOCHASTIC PROCESS BY K.B.DATTA AND M.A S.SRINIVAS,CENGAGE PUBLICATIONS
2) PROBABILITY, STATISTICS AND STOCHASTIC PROCESS BY PROF.A R K PRASAD., WIELY INDIA
3) PROBABILITY AND STATISTICS BY T.K.V.IYENGAR&B.KRISHNA GANDHI etel
4) A TEXT BOOK OF PROBABILITY AND STATISTICS, SHAHNAZ BATHUL , CENGAGE LEARNING

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
                                                          3   1   0   4

FLUID MECHANICS

Pre Requisites: Engineering Mechanics

Course Objectives: The objectives of the course are to

- Introduce the concepts of fluid mechanics useful in Civil Engineering applications
- Provide a first level exposure to the students to fluid statics, kinematics and dynamics.
- learn about the application of mass, energy and momentum conservation laws for fluid flows
- train and analyse engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
- To obtain the velocity and pressure variations in various types of simple flows
- to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology

UNIT – I
Properties of Fluid
Distinction between a fluid and a solid;
Density,Specificweight,Specificgravity,Kinematicanddynamicviscosity;variation of viscosity with temperature,   Newton law of viscosity;   vapour pressure, boiling point, cavitation; surfacetension, capillarity, Bulk modulus of elasticity ,compressibility.

Fluid Statics
FluidPressure:Pressure atapoint,Pascalslaw,pressurevariation withtemperature, density andaltitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges.Hydrostaticpressureandforce:horizontal,verticalandinclinedsurfaces.   Buoyancy and stability of floating bodies.

UNIT - II
Fluid Kinematics
Classification of fluid flow : steady and unsteady flow;uniform andnon-uniform flow;laminarandturbulentflow; rotational and irrotationalflow; compressibleandincompressibleflow;idealandrealfluidflow; one,twoandthree dimensionalflows;Streamline, pathline, streak lineandstreamtube;streamfunction, velocity potential function. One,two and three dimensionalcontinuity equations in Cartesiancoordinates.

Fluid Dynamics
Surface and Body forces -Euler's and Bernoulli's equation; Energy correction factor; Momentum equation. Vortex flow – Free and Forced. Bernolli's equation to real fluid flows.

UNIT - III
Flow Measurement in Pipes
Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend.

Flow Over Notches & Weirs
Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

UNIT – IV
Flow through Pipes
Reynolds experiment, Reynolds number, Lossofheadthroughpipes,Darcy-Wiesbatchequation, minorlosses,totalenergyline,hydraulicgradeline,Pipesinseries,equivalentpipes, pipesinparallel,siphon,branchingofpipes,three reservoirproblem, powertransmission through pipes.Analysisofpipenetworks:HardyCrossmethod,waterhammerin pipesandcontrolmeasures,

UNIT - V
Laminar & Turbulent Flow
Laminarflowthrough:circularpipes,annulus andparallelplates.

Boundary Layer Concepts
Boundary Layer Analysis-Assumption and concept of boundary layer theory.Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.Definition of Drag and Lift and types drag, ,magnus effect.
.

Course Outcomes (COs): Upon completion of this course, students should be able to:
- Understand the broad principles of fluid statics, kinematics and dynamics
- Understand definitions of the basic terms used in fluid mechanics and characteristics of fluids and its flow
- Understand classifications of fluid flow
- Be able to apply the continuity, momentum and energy principles

Text Books
1. Fluid Mechanics by Modi and Seth ,Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited,2015.

Ref 1. Fluid Mechanics by R.C.Hibbeler, Pearson India Education Servieces Pvt.
Ltderence Books
1. TheoryandApplicationsofFluidMechanics,K.Subramanya,TataMcGrawHill
2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited
3. Fluid MechanicsandMachinery,C.S.P.Ojha, R.BerndtssonandP.N.Chadramouli, OxfordUniversityPress, 2010
4. Fluid mechanics & Hydraulic Machines, Domkundwar&DomkundwarDhanpat Rai &Co
5. Fluid Mechanics and Hydraulilc Machines, R.K. Bansal, Laxmi Publication Pvt Ltd.

II Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
                                                                0   0   3   1.5

COMPUTER AIDED DESIGN LAB

Pre Requisites: Engineering Mechanics

Course Objectives: The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

List of Experiments:

1. Introduction to computer aided drafting and different coordinate system
2. Drawing of Regular shapes using Editor mode
3. Introduction GUI and drawing of regular shapes using GUI
4. Exercise on Draw tools
5. Exercise on Modify tools
6. Exercise on other tools (Layers, dimensions, texting etc.)
7. Drawing of building components like walls, lintels, Doors, and Windows. using CAD software
8. Drawing a plan of Building and dimensioning
9. Drawing a plan of a residential building using layers
10. Developing a 3-D plan from a given 2-D plan
11. Developing sections and elevations for given
     a) Single storied buildings   b) multi storied buildings

12. Auto CAD applications in surveying, mechanics etc.

TEXT BOOKS:

1. Computer Aided Design Laboratory by M. N. SeshaPraksh& Dr. G. S. Servesh –Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

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

- Use the Autocad commands for drawing 2D & 3D building drawings required for different civil engg applications.
- Plan and draw Civil Engineering Buildings as per aspect and orientation.
- Presenting drawings as per user requirements and preparation of technical report

II Year B.Tech. Civil Engg. I-Sem

	L	T	P	C
	0	0	3	1.5

STRENGTH OF MATERIALS LAB

Pre Requisites: Strength of Materials – Theory

Course Objectives:

- Make measurements of different strains, stress and elastic properties of materials used in Civil Engineering.
- Provide physical observations to complement concepts learnt
- Introduce experimental procedures and common measurement instruments,equipment, devices.
- Exposure to a variety of established material testing procedures and techniques
- Different methods of evaluation and inferences drawn from observations

List of Experiments:

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges
12. Continuous beam – deflection test.

Course Outcomes:

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

- Configure &Operate a data acquisition system using various testing machines of solid materials
- Compute and Analyze engineering values (e.g. stress or strain) from laboratory measurements.
- Write a technical laboratory report

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. I-Sem

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ENGINEERING GEOLOGY LAB

Pre Requisites: Engineering Geology Theory

Course Objectives: The objective of this lab is that to provide practical knowledge about physical properties of minerals, rocks, drawing of geological maps, showing faults, uniformities etc.

List of Experiments

1. Study of physical properties of minerals.

2. Study of different group of minerals.

3. Study of Crystal and Crystal system.

4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.

5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.

6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.

7. Identification of rocks (Metamorphic Petrolody): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.

8. Study of topographical features from Geological maps. Identification of symbols in maps.

9. Simple structural Geology Problems(Folds, Faults & Unconformities)

Course Outcomes: At the end of the course, the student will be able to:
- Understands the method and ways of investigations required for Civil Engg projects
- Identify the various rocks, minerals depending on geological classifications
- Will able to learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides and settlement.
- Write a technical laboratory report

LAB EXAMINATION PATTERN:
1. Description and identification of SIX minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.

4. Simple strike and Dip problems.
5. Microscopic identification of rocks.

II Year B.Tech. Civil Engg. II-Sem   **L T P C**
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BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING

Course Objectives: Objectives of this course are
- To introduce the concept of electrical circuits and its components
- To introduce the concepts of diodes and transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes: After this course, the student will be able
- To analyze and solve problems of electrical circuits using network laws and theorems.
- To identify and characterize diodes and various types of transistors.

UNIT- I
Electrical Circuits: R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis,
Single Phase AC Circuits: R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

UNIT-II
Resonance: Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.
Network Theorems: Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

UNIT- III
P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.
Rectifiers and Filters: P-N junction as a rectifier – Half Wave Rectifier, Ripple Factor – Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT- IV
Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations. Transistor Biasing And Stabilization – Operating point, DC and AC load lines, Biasing – Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in VBE and β, Bias Compensation using Diodes and Transistors.

Transistor Configurations: BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

UNIT- V

Junction Field Effect Transistor: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

Special Purpose Devices: Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

Text books:

- Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University

- Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath Mc Graw Hill Education

References:

- Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.

- Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998.

- Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.

- Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.

- Network Theory by N. C. Jagan and C. Lakshminarayana, B.S. Publications.

- Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**

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BASICS OF MECHANICAL ENGINEERING

Course Objectives: Understanding of basic principles of Mechanical Engineering is required in various field of engineering.

Course Outcomes: After learning the course the students should be able to

   To understand the fundamentals of mechanical systems.

   To understand and appreciate significance of mechanical engineering in different Fields of engineering.

UNIT – I Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth Law and First law. Energy: Introduction and applications of Energy sources like Fossil fuels, nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion.

UNIT – II Properties of gases: Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process Properties of Steam: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters. Steam Boilers: Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, functioning of different mountings and accessories.

UNIT – III Heat Engines: Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles. Internal Combustion Engines: Introduction, Classification, Engine details, four- stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies.

UNIT – IV Pumps: Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming Air Compressors: Types and operation of Reciprocating and Rotary air compressors, significance of Multistage. Refrigeration & Air Conditioning: Refrigerant, Vapor compression refrigeration system, vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.

UNIT – V Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc). Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive. Engineering Materials: Types and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer.

TEXT BOOKS:

- Basic Mechanical Engineering / Pravin Kumar/ Pearson

- Introduction to Engineering Materials / B.K. Agrawal/ Mc Graw Hill

REFERENCE BOOKS:

- Fundamental of Mechanical Engineering/ G.S. Sawhney/PHI

- Thermal Science and Engineering / Dr. D.S. Kumar/ Kataria

For all other B.Tech 3rd Year 1st Sem syllabus go to **JNTUH B.Tech Mechanical Engineering 3rd Year 1st Sem Course Structure for (R16) Batch.**

II Year B.Tech. Civil Engg. II-Sem   **L T P C**

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SURVEYING & GEOMATICS

Course Objectives:
The object of the course student should have the capability to:

     Know the principle and methods of surveying.

     Measure horizontal and vertical- distances and angles

     Recording of observation accurately

     Perform calculations based on the observation

     Identification of source of errors and rectification methods

     Apply surveying principles to determine areas and volumes and setting out curves

     Use modern surveying equipment's for accurate results

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances-   Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

UNIT - II

Leveling- Types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas - Determination of areas consisting of irregular boundary and regular boundary.

Volumes -Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Omitted measurements.

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves.

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry,

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station-advantages and Applications. Field Procedure for total station survey, Errors in Total Station Survey, Global Positioning System- Principle and Applications.

UNIT - V

Photogrammetry Surveying:

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

Course Outcomes: Course will enable the student to:
- Apply the knowledge to calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments, measurement errors and corrective measures
- Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies

TEXT BOOKS:
1. Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi.
2. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

REFERENCES:
1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. Arora K R "Surveying Vol 1, 2 & 3), Standard Book House, Delhi.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. II-Sem

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STRENGTH OF MATERIALS – II

Pre Requisites: Strength of Materials -I

Course Objectives: The objective of this Course is

- To understand the nature of stresses developed in simple geometries shafts, springs, columns &cylindrical and spherical shells for various types of simple loads
- To calculate the stability and elastic deformation occurring in various simple geometries for different types of loading.
- To understand the unsymmetrical bending and shear center importance for equilibrium conditions in a structural members of having different axis of symmetry.

UNIT – I
TORSION OF CIRCULAR SHAFTS :
Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure.
SPRINGS : Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

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

UNIT - III
DIRECT AND BENDING STRESSES:
Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability-Overturning and sliding – stresses due to direct loading and bending moment about both axis.

UNIT – IV
THIN CYLINDERS :
Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

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

UNIT – V
UNSYMETRICAL BENDING :
Introduction – Centroidal principal axes of section –Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis.

SHEAR CENTRE: Introduction - Shear centre for symmetrical and unsymmetrical (channel, I, T and L) sections

Course Outcome:
On completion of the course, the student will be able to:
- Describe the concepts and principles, understand the theory of elasticity, and perform calculations, relative tothe strength of structures and mechanical components in particular to torsion and direct compression;
- to evaluate the strains and deformation that will result due to theelastic stresses developed within the materials for simple types of loading
- Analyze strength and stability of structural members subjected to Direct, and Directand Bending stresses;
- Understand and evaluate the shear center and unsymmetrical bending.
- Frame an idea to design a system, component, or process

Text Books:
1) Strength of Materials by R.K Rajput, S.Chand& Company Ltd.
2) Mechanics of Materials by Dr.B.CPunmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain
References:

1) Strength of Materials by R.Subramanian, Oxford University Press.
2) Mechanics of Materials by R.C.Hibbeler, Pearson Education
3) Engineering Mechanics of Solids by Popov E.P. Printice-Hall Ltd
4) Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
5) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.
6) Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd

II Year B.Tech. Civil Engg. II-Sem   **L T   P   C**
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HYDRAULICS & HYDRAULIC MACHINERY

Course Objectives: the objective of the course is

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

UNIT-I
Open Channel Flow – I
Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channels, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factorsaffecting Manning'sRoughnessCoefficient"n". Most economical sections. Computation of Uniform flow, Normal depth.

Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

UNIT-II
Open Channel Flow – II
Non uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.

Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

UNIT-III
Dimensional Analysis and Hydraulic Similitude
Dimensional homogeneity – Rayleigh's method and Buckingham's pi methods – Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

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

UNIT-IV

Hydraulic Turbines – I

Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.

Hydraulic Turbines – II

Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

UNIT-V

Centrifugal Pumps

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

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

Outcomes:

At the end of the course the student will able to

- applytheirknowledgeoffluidmechanicsin addressingproblemsinopenchannels and hydraulic machinery.
- Understand and solveproblemsinuniform,graduallyandrapidlyvariedflows in open channel insteadystateconditions.
- apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems.
- Get the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages

Text Books

1. Fluid Mechanics by Modi and Seth ,Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited,2015

REFERENCES

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. II-Sem

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STRUCTURAL ANALYSIS – I

Pre Requisites: Strength of Materials –I

Objectives:the objective of the course is to
- **Differentiate** the statically determinate and indeterminate structures.
- To understand the nature of stresses developed in perfect frames and three hinged archesfor various types of simple loads
- **Analyse**the statically indeterminate members such as fixed bars, continuous beams and for various types of loading.
- Understand the energy methods used to derive the equations to solve engineering problems
- **Evaluate** the Influence on a beam for different static & moving loading positions

UNIT – I
ANALYSIS OF PERFECT FRAMES: Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT – II
ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem- Unit Load Method - Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.
THREE HINGED ARCHES – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular archeshaving supports at different levels - Absolute maximum bending moment diagram for a three hinged arch.

UNIT-III
PROPPED CANTILEVER and FIXED BEAMS: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

UNIT – IV

CONTINUOUS BEAMS: Introduction-Continuous beams - Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - effect of sinking of supports.

SLOPE DEFLECTION METHOD: Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminaciesfor frames - Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway - Shear force and bending moment diagrams and Elastic curve.

UNIT – V

MOVING LOADS and INFLUENCE LINES: Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses - Equivalent uniformly distributed load -Focal length.

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

- An ability to apply knowledge of mathematics, science, and engineering
- Analyse the statically indeterminate bars and continuous beams
- **draw strengthbehaviour** of members for static and dynamic loading.
- **Calculate** the stiffness parameters in beams and pin jointed trusses.
- **Understand the indeterminacy** aspects to consider for a total structural system.
- Identify, formulate, and solve engineering problems with real time loading

Text Books:
1) Structural Analysis Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers.
2) Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.

REferences:
1) Structural analysis T.S Thandavamoorthy, Oxford university Press
2) Structural Analysis by R.C.Hibbeler, Pearson Education
3) Basic Structural Analysis by K.U.Muthu*et al.,*I.K.International Publishing House Pvt.Ltd
4) Mechanics of Structures Vol – I and II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
5) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Education Pvt. Ltd.
6) Fundamentals of Structural Analysis by M.L.Gamhir, PHI Learning Pvt. Ltd

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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SURVEYING LAB

Pre Requisites: Surveying Theory

Course Objectives:

- To impart the practical knowledge in the field- measuring distances, directions, angles,
- To determining R.L.'s areas and volumes
- To set out Curves
- To stake out points
- To traverse the area
- To draw Plans and Maps

List of Experiments

1. Surveying of an area by chain, and compass survey (closed traverse) & plotting.
2. Determine of distance between two inaccessible points with compass
3. Radiation method, intersection methods by plane table survey.
4. Levelling – Longitudinal and cross-section and plotting
5. Measurement of Horizontal and vertical angle by theodolite
6. Trigonometric leveling using theodolite
7. Height and distances using principles of tachometric surveying
8. Determination of height, remote elevation, distance between inaccessible points using total station
9. Determination of Area using total station and drawing map
10. Traversing using total station for drawing contour map
11. Stake out using total station
12. Setting out Curve using total station

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

- Apply the principle of surveying for civil Engineering Applications
- Calculation of areas, Drawing plans and contour maps using different measuring equipment at field level
- Write a technical laboratory report

JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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BASIC ELECTRICAL & ELECTRONICS LAB

Basic Electrical Engineering Laboratory-I

List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
(b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit

Basic Electronics Engineering Laboratory-I

• There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given. Lectures on measurement techniques and error calculation will also have to be organized.
• 3 hours per week must be kept, initially for practical lectures, and later for tutorials.
List of Experiments:
1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
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JNTUH COLLEGE OF ENGINEERING HYDERABAD

II Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Pre Requisites: FM & HHM Theory

Course Objectives
- To **identify** the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- To **explain** the standard measurement techniques of fluid mechanics and their applications.
- To **illustrate** the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- To **analyze** the laboratory measurements and to document the results in an appropriate format.

List of Experiments
   1. Verification of Bernoulli's equation
   2. Determination of Coefficient of discharge for a small orifice by a constant head method
   3. Calibration of Venturimeter / Orifice Meter
   4. Calibration of Triangular / Rectangular/Trapezoidal Notch
   5. Determination of Minor losses in pipe flow
   6. Determination of Friction factor of a pipe line
   7. Determination of Energy loss in Hydraulicjump
   8. Determination of Manning's and Chezy's constants for Open channel flow.
   9. Impact of jet on vanes
   10. Performance Characteristicsof Pelton wheel turbine
   11. Performance Characteristics of Francis turbine
   12. Performance characteristics of Keplan Turbine
   13. Performance Characteristics of a single stage / multi stage Centrifugal Pump

Course Outcomes
Students who successfully complete this course will have demonstrated ability to:
- **Describe** the basic measurement techniques of fluid mechanics and its appropriate application.
- **Interpre**t the results obtained in the laboratory for various experiments.
- **Discover** the practical working of Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- **Compare** the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
- Write a technical laboratory report

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem

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STRUCTURAL ANALYSIS – II

Pre Requisites: SA- I

Course Objectives:
> The objectives of the course are to
> - Identify the various actions in arches.
> - Understand classical methods of analysis for statically indeterminate structures.
> - Differentiate the approximate and numerical methods of analysis for indeterminate structures.
> - Findthe degree of static and kinematic indeterminacies of the structures.
> - Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

UNIT – I

TWO HINGED ARCHES: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

MOMENT DISTRIBUTION METHOD - Analysis of continuous beams with and without settlement of supports using -Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames -Shear force and Bending moment diagrams, Elastic curve.

UNIT – II

KANI'S METHOD: Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side Sway usingKani's Method - Shear force and bending moment diagrams - Elastic curve.

CABLES and SUSPENSION BRIDGES:

Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of acable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

UNIT – III

APPROXIMATE METHODS OF ANALYSIS: Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method and Factor method - Analysis of multi-storey frames for gravity loads - Substitute Frame method - Analysis of Mill bents.

UNIT – IV

MATRIX METHODS OF ANALYSIS: Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods -

Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods-Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

UNIT- V
INFLUENCE LINES FOR INDETERMINATE BEAMS: Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.
INDETERMINATE TRUSSES: Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies – Castigliano's second theorem.

Course Outcomes
After the completion of the course student should be able to
- **Analyze** the two hinged arches.
- **Solve** statically indeterminate beams and portal frames using classical methods
- **Sketch** the shear force and bending moment diagrams for indeterminate structures.
- **Formulate** the stiffness matrix and analyze the beams by matrix methods

Text Books:
1) Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2) Structural Analysis Vol I & II by G.S. Pandit S.P.Gupta Tata McGraw Hill Education Pvt. Ltd.

References:
1. 1)Indeterminate Structural Analysis by K.U.Muthu et al., I.K.International Publishing House
2. Pvt.Ltd
3. Structural analysis T.S Thandavamoorthy, Oxford university Press
4. Mechanics of Structures Vol –II by H.J.Shah and S.B.Junnarkar, Charotar
5. Publishing House Pvt. Ltd.
6. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.
7. Examples in Structural Analysis by William M.C.McKenzie, Taylor & Francis.
8. Structural Analysis by R. C. Hibbeler, Pearson Education
9. Structural Analysis by Devdas Menon, Narosa Publishing House.
10. Advanced Structural Analysis by A.K.Jain, Nem Chand & Bros.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
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GEOTECHNICAL ENGINEERING

Pre-Requisites: Engineering Geology, Applied Mechanics, Fluid Mechanics

Course Objectives: the objectives of the course are to

- understand the formation of soil and classification of the soils
- determine the Index & Engineering Properties of Soils
- determine the flow characteristics & stresses due to externally applied loads
- estimate the consolidation properties of soils
- estimate the shear strength and seepage loss

UNIT – I

INTRODUCTION: Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density.
INDEX PROPERTIES OF SOILS: Grain size analysis – consistency limits and indices – I.S. Classification of soils.

UNIT –II
PERMEABILITY: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils .

EFFECTIVE STRESS & SEEPAGE THROUGH SOILS: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT –III
STRESS DISTRIBUTION IN SOILS: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.
COMPACTION: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV
CONSOLIDATION: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation **-** stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT - V

SHEAR STRENGTH OF SOILS: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.

OUTCOMES:

At the end of the course the student will able to
- Characterize and classify the soils
- Able to estimate seepage, stresses under various loading conditions and compaction characteristics
- Able to analyse the compressibility of the soils
- Able to understand the strength of soils under various drainage conditions

Text books:
1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International PvtLtd,
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.

References:

1. Foundation Engineering by P.C.Varghese, PHI
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
3. Principals of Geotechnical Engineering by BrajaM.Das, Cengage Learning Publishers.
4. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
5. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
6. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.
7. Soil Mechanics and Foundation by byB.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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STRUCTURAL ENGINEERING – I (RCC)

Pre-Requisites: Structural Analysis I & II

Course Objectives
The objectives of the course are to
- **Identify** the basic components of anystructural system and the standard loading for the RC structure
- **Identify** and **tell** the various codal provisions given in IS. 456
- **Describe** the salient feature of limit state method, compare with other methods and the concepts of limit state of collapse and limit state of serviceability
- **Evaluate**the behaviour of RC member under flexure, shear and compression, torsion and bond.

UNIT -I
Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility– Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load– Forces – What is meant by Design? – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000.
Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing of reinforcement

UNIT – II
Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement

UNIT - III
Design of Two-way slabs with different end conditions, one way slab, and continuous slab Using I S Coefficients - Design of dog-legged staircase –
Limit state design for serviceability for deflection, cracking and codal provisions.

UNIT – IV

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

UNIT – V

Design of foundation - Different types of footings – Design of wall footing – Design of flat isolated square, rectangulal, circular footings and combined footings for two columns.

Course Outcomes
After the completion of the course student should be able to
- **Compare** and **Design** the singly reinforced, doubly reinforced and flanged sections.
- **Design** the axially loaded, uniaxial and biaxial bending columns.
- **Classify** the footings and **Design** the isolated square, rectangular and circular footings
- **Distinguish** and **Design** the one-way and two-way slabs.

TEXT BOOKS:
1. Limit state designed of reinforced concrete – P.C.Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers.

REFERENCES :
1. 1.Reinforced concrete design by S.Unnikrishna Pillai &Devdas Menon, Tata Mc.Graw Hill.
2. Reinforced concrete structures, Vol.1, by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd.
3. 2.Fundamentals of Reinforced concrete design by M.L. Gambhir,Printice Hall of India Pvt.Ltd.,
4. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press
5. Design of concrete structures by J.N.Bandhyopadhyay PHI Learning Private Limited.
6. Design of Reinforced Concrete Structures by I.C.Syal and A.K.Goel, S.Chand& company.
7. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.

NOTE :
Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem	L	T	P	C
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TRANSPORTATION ENGINEERING

Pre-Requisites: Surveying

Course Objectives:

- This course aims at providing a comprehensive insight of various elements of Highway transportation engineering. Topics related to the highway development, characterisation of different materials needed for highway construction, structural and geometric design of highway pavements along with the challenges and possible solutions to the traffic related issues will be covered as a part of this course.

UNIT -I
Introduction, History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Highway development in India, Highway planning, Highway alignment, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.

UNIT – II
Introduction to Highway Geometric Design; Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves

UNIT - III
Basic traffic characteristics: Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities – on-street and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; Road Intersections: Design considerations of at-grade intersections, introduction to interchanges

UNIT - IV

Tests on soils: CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders; Bituminous Concrete: Critical parameters controlling bituminous concrete mixture design, aggregate blending concepts viz. Rothfuch's method, trial and error procedure. Introduction to advanced concretes for road applications.

UNIT -V

Introduction to Pavement Design:Types of pavements and their typical cross sections: flexible, rigid and composite; Flexible Pavement analysis and design: Introduction to multi layered analysis, IRC 37-2012 method of flexible pavement design; Rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavement slabs, IRC 58-2015 method of rigid pavement design; Overlay Designs: Types of overlays on flexible and rigid pavements.

Out Comes

At the end of this course, the students will develop:

- An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance
- An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways.
- An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil subgrade and environmental conditions using the standards stipulated by Indian Roads Congress.
- An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines.
- An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioural patterns.

Textbooks:

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros. Revised Tenth Edition, 2014

2.Kadiyali L.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition, First Reprint; Khanna Publishers, New Delhi, 2018

Code of Provisions:
Design Codes: IRC 37-2012, IRC 58-2015, IRC 81-1997

Reference books;
- Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018.

- Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1st Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.

- Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014

- C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1st Edition, Universities Press, 2016

- Garber, N.J. and Hoel, L.A. Traffic and Highway Engineering, Fourth Edition; Cengage Learning, Stamford, CT, USA, 2010

- Parthachakroborty and Animesh Das, Principles of Transportation Engineering, PHI, 2013

Nicholas J Garber and Lester AHoel, Traffic and Highway Engineering, 5th Edition, Cengage Learning India Private Limited, New Delhi, 5th Indian Reprint, 201

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem   **L T P C**
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ENGINEERING ECONOMICS AND ACCOUNTING

Pre-Requisites: Mathematics

Course Objectives: To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.

Course Outcomes: Student will able to solve various business problem up make various business decision

Unit I Introduction & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting,* Factors governing demand forecasting, methods of demand forecasting.

Unit II Production & Cost Analysis: *Production Function* – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. *Cost Analysis***:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing. Methods of Pricing. *Business:*Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types,*New Economic Environment*: Changing Business Environment in Post-liberalization scenario.

Unit IV Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital Trading Forecast Capital Budget, Cost Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

Unit V Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions Introduction IFRS Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).*Financial Analysis***:** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
2. Vijay Kumar & Appa Rao Managerial Ecoconomics & Financial Analysis, Cengage 2011.
3. J. V. Prabhakar Rao & P.V. Rao Managerial Ecoconomics & Financial Analysis, Maruthi Publishers, 2011.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2009
4. Domnick Salvatore: Managerial Economics In a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Kasi Reddy Sraswathi, MEFA PHI Learning, 2012.
10. Shailaja &Usha : MEFA, University Press, 2012.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
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HIGHWAY ENGINEERING AND CONCRETE TECHNOLOGY LAB

Pre-Requisites: Building Materials,Concrete Technology, Highway Materials
Course Objectives: The objectives of the course

- To learn laboratory tests and their procedures cement, fine aggregate, course aggregates and bitumen
- **To Evaluate** fresh concrete properties
- **To Understand** the test procedures for characterization of Concrete and bituminous mixes

Student shall be able to
Categorizethe test on materials used Civil Engineering Building&Pavementconstructions
To perform the tests on concrete for it characterization.
To Design Concrete Mix Proportioning by Using Indian Standard Method.
Examine the tests performed for Bitumen mixes.
To prepare a laboratory report

List of Experiments

I. Test on Cement
1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement
5. Compressive strength of cement
6. Workability test on concrete by compaction factor, slump and Vee-bee.

II. Test on Aggregates (Coarse and Fine)

1. Specific gravity (Pycnometer and wire basket),water absorption
2. Shape(Flakiness and elongation indices)
3. Impact and abrasion value tests
4. Crushing resistance and durability tests
5. Sieve Analysis and gradation charts (Job mix formula using Rothfuch's charts)
6. Bulking of sand, Bulk and compact densities of fine and coarse aggregates

III. Test on Fresh Concrete
1. Slump test
2. CF (compact factor stress)
3. Vee-bee Test
4. Flow Table Test

IV. Test on hardened concrete

1. Compression test on cubes & Cylinders
2. Flexure test
3. Split Tension Test
4. Modulus of Elasticity

V. Tests on Bitumen and Bituminous concrete

1. Penetration, softening point and spot test
2. Ductility, Elastic recovery and viscosity
3. Flash and fire points and specific gravity
4. Marshall's Stability (sample preparation and testing for stability and flow values)

TEXT BOOKS:

1. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons
2. Highway Material Testing manual, Khanna ,Justo and Veeraraghavan, Nemchand Brothers

IS CODES:

1. IS 10262 :2009 "Concrete Mix Proportioning – Guidelines"
2. 1S 516:2006 "Methods of Tests on Strength of Concrete"
3. IS 383 :1993 "Specification For Coarse And Fine Aggregates From Natural Sources For Concrete"
4. 1S 1201 -1220 (1978) "Methods for testingtars and bituminous materials"
5. IRC SP 53 -2010 "Guidelines on use of modified bitumen"
6. MS-2 Manual for Marshalls Mix design 2002

III Year B.Tech. Civil Engg. I-Sem

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GEO TECHNICAL ENGINEERING LAB

Pre-Requisites: Soil Mechanics (Co-requisite)

Course Objectives: To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.

Course Outcomes: At the end of the course, the student will be able to Classify and evaluate the behavior of the soils subjected to various loads.

LIST OF EXPERIMENTS

1. Atterberg Limits (Liquid Limit, Plastic Limit, and shrinkage limit)
2. a) Field density by core cutter method and

   b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Differential free swell index (DFSI) test

REFERENCE:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem

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ADVANCED COMMUNICATION LAB ****

Pre-Requisites: English

Course Objectives: The purpose of this course is to develop the students competence in communication at an advanced level. Assuming that the students are fairly proficient in the basic communication skills of listening, speaking, reading and writing in English, this course aims to train them in communicating efficiently in the workplace and professional contexts.

Course Outcomes: Communicate efficiently in the work place up professioal context

1. Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:
- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:
- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Learning Outcomes

✎ Accomplishment of sound vocabulary and its proper use contextually.
✎ Flair in Writing and felicity in written expression.
✎ Enhanced job prospects.
✎ Effective Speaking Abilities

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. Prescribed Lab Manual: A book titled *A Course Book of Advanced Communication Skills(ACS) Lab* published by Universities Press, Hyderabad.

6. Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 8th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
    - **Preparing for being Interviewed**
    - **Positive Thinking**
    - **Interviewing Skills**
    - **Telephone Skills**
    - **Time Management**

7. Books Recommended:
1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
3. **Advanced Communication Skills Laboratory Manual** by Sudha Rani, D, Pearson Education 2011.
4. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. **Business and Professional Communication:** Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
6. **The Basics of Communication:A Relational Perspective**. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.
8. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
9. **Handbook for Technical Communication** by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
10. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
12. **Job Hunting** by Colm Downes,Cambridge University Press 2008.
13. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.
14. **English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.**
15. Books on **TOEFL/GRE/GMAT/CAT/IELTS** by Barron's/DELTA/Cambridge University Press.
16. **International English for Call Centres** by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:
Advanced Communication Skills Lab Practicals:

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation
      1.   **Seminar/ Professional Presentation**
      2.   **A Report on the same has to be prepared and presented.**
*   *Teachers may use their discretion to choose topics relevant and suitable to the needs of students.*
*   *Not more than two students to work on each mini project.*
*   *Students may be assessed by their performance both in oral presentation and written report.*

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem
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ENVIRONMENTAL ENGINEERING

Pre Requisites: Fluid Mechanic

Course Objectives: This subject provides the knowledge of water sources, water treatment, design of distribution system waste water treatment, and safe disposal methods. The topics of characteristics of waste water, sludge digestion are also included.

UNIT – I
Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

UNIT – II
Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

UNIT - III
characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self purification of rivers.

UNIT – IV
Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters –ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

UNIT – V

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of particulates –Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

Course Outcomes: At the end of the course, the student will be able to:
- Assess characteristics of water and wastewater and their impacts
- Estimate quantities of water and waste water and plan conveyance components
- Design components of water and waste water treatment plants
- Be conversant with issues of air pollution and control

TEXT BOOKS:
1. Environmental Engineering by H.S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.

REFERENCES:
1. Environmental Engineering I and II by BC Punmia, Std. Publications.
2. Environmental Engineering I and II by SK Garg, Khanna Publications.
3. Environmental Pollution and Control Engineering CS Rao, Wiley Publications

4. Water and Waste Water Technology by Steel, Wiley
5. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
6. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
7. Water and Waste Water Technology by Mark J Hammar and Mark J. HammarJr.Wiley, 2007.
8. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice
9. Hall, New Jersey.
10. Introduction to Environmental Engineering by P. AarneVesilind, Susan M. Morgan,
    a. Thompson /Brooks/Cole; Second Edition 2008.
11. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill
    a. Publication

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem
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FOUNDATION ENGINEERING

Pre-Requisites: Soil Mechanics

Objectives:
To Plan Soil explorationprogramme for civil Engineering Projects
To check the stability of slopes
To determine the lateral earth pressures and design retaining walls
To determine the Bearing capacity of Soil
To design pile group foundation

UNIT – I
SOIL EXPLORATION: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.

UNIT – II
SLOPE STABILITY: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices – Taylor's Stability Number- stability of slopes of earth dams under different conditions.

UNIT – III
EARTH PRESSURE THEORIES: Active , Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.

RETAINING WALLS: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

UNIT –IV
SHALLOW FOUNDATIONS- Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

UNIT -V
PILE FOUNDATION: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

Outcomes:

At the end of the course the student will able to
- understand the principles and methods of Geotechnical Exploration
- decide the suitability of soils and check the stability of slopes
- calculate lateral earth pressures and check the stability of retaining walls
- analyse and design the shallow and deep foundations

Text books:
1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt . Ltd, New   Delhi
2. Principals of Geotechnical Engineering by BrajaM.Das, Cengage Learning Publishers.

References:

1. Soil Mechanics and Foundation Engineeringby VNS Murthy, CBS Publishers and Distributors.
2. Geotechnical Engineering Principles and Practices by Cuduto, PHI Intrernational.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd
   (1998).
4. Geotechnical Engineering by S. K.Gulhati&Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.
5. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, New york.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem	L T P C
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STRUCTURAL ENGINEERING – II (Steel)

Pre-Requisites: Structural Analysis I & II

Course Objectives
The objectives of the course is to

- Explain the mechanical properties of structural steel , plasticity ,yield .
- **Describe** the salient features of Limit State Method of design of Steel structures.
- **Identify** and **explain** the codal provisions given in IS. 800.
- **Analyze** the behaviour of steel structures under tension, compression and flexure.
- **Design** the tension, compression , flexural members andplate girder
- Design the connectrion in steel structure,build -up member and (bolted and welded).

UNIT – I
Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths- deflection limits – serviceability – stability check.
Design of Connections– Different types of connections – Bolted connections –Design strength – efficiency of joint–prying action - Welded connections – Types of welded joints – Design requirements - Design of Beam-column connections- Eccentric connections - Type I and Type II connection – Framed connection– stiffened / seated connection.

UNIT – II
Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.
Design of compression members – Buckling class – slenderness ratio –Design of simple compression members - laced – battened columns – splice – column base – slab base.

UNIT – III
*Plastic Analysis;*Plastic moment – Plastic section modulus - Plastic analysis of continuous beams

Design of Flexural Members –Laterally supported and unsupported Beams – Design of laterally supported beams- Bending and shear strength/buckling – Built-up sections - Beam splice

UNIT – IV

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediatestiffeners – Design of web splice and flange splice.

UNIT – V
Design of Industrial Structures;Types of roof trusses - loads on trusses – wind loads - Purlin design – truss design –Design of welded Gantry girder

Note: Design of structural members include detailed sketches.

Course Outcomes:
After the completion of the course student should be able to
- Analyze the tension members, compression members.
- Design the tension members, compression members and column bases and joints and connections
- Analyze and Design the beams including built-up sections and beam and connections.
- Identify and Design the various components of welded plate girder including stiffeners

Text Books:
1.Design of steel structures by S.K.Duggal,Tata Macgrawhill publishers,2000,2nd Edition
2.Design of steel structures by N.Subramanian,Oxford University press,2008
Reference Books:

1. Design of steel structures by K.S.Sairam,Pearson Educational India, 2nd Edition,2013
2. Design of steel structures by Edwin H.Gayrold and Charles Gayrold,Tata Mac-grawhill publishers,1972
3. Design of steel structures by L.S.JayaGopal,D.Tensing,Vikas Publishing House

NOTE :

Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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HYDROLOGY & WATER RESOURCES ENGINEERING

Pre-Requisites: Fluid Mechanics & HHM

Course Objectives:

This course provides the description of hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle. and its components. Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.

Unit - I
Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering. Sources of data.
Precipitation
Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic, Theissen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

Unit - II
Abstractions from precipitation
Evaporation process, evaporimeters,analytical methodsofevaporationestimation,reservoirevaporationand methodsfor itsreduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney &Criddle Methods, potentialevapotranspiration overIndia,actual evapotranspiration, ,interception,depression storage,infiltration,infiltrationcapacity,measurementof infiltration,modellinginfiltration capacity,classificationofinfiltrationcapacities,infiltrationindices.
Runoff
Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

Unit - III
Hydrographs
Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function - Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

Unit - IV

Groundwater Hydrology

Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law. **Well Hydraulics -** Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

Crop Water Requirements– Water requirementofcrops-CropsandcropseasonsinIndia,croppingpattern,duty anddelta; Quality ofirrigationwater;Soil-waterrelationships,rootzonesoilwater,infiltration, consumptiveuse,irrigationrequirement,frequencyofirrigation;Methodsofapplyingwater tothefields:surface,sub-surface,sprinklerand trickle /dripirrigation.

Unit - V
Canal Systems: Canal systems, alignment of canals, canallosses,estimation of designdischarge.Designofchannels-rigidboundary channels,alluvialchannels, Regime channels, Kennedy'sandLacey'stheoryofregime channels. Canaloutlets: non-modular,semi-modular andmodularoutlets.Waterlogging:causes,effects andremedialmeasures.Lining of canals-Typesoflining-Advantages and disadvantages.Drainageofirrigatedlands- necessity,methods.

Course Outcomes:
At the end of the course the student will be able to
- Understand the different concepts and terms used in engineering hydrology
- To**identify and** explain various formulae used in estimation of surface and Ground water hydrology components
- Demonstrate their knowledge to **connect**hydrology to the field requirement

Text Books
1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers

Reference Books
1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age International)
5. G L Asawa, IrrigationEngineering, WileyEastern

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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ENVIRONMENTAL ENGINEERING LAB

Course Objectives: the objectives of the course are to
- **Perform** the experiments to determine water and waste water quality
- **Understand** the water & waste water sampling, their quality standards
- **Estimate** quality of water, waste water, Industrial water

Practical Work: List of Experiments

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/DO
12. Determination of Residual Chlorine
13. Total count No.
14. Noise level measurement

Course outcomes
After the completion of the course student should be able to
- **Understand** about the equipment used to conduct the test procedures
- **Perform** the experiments in the lab
- **Examine** and **Estimate** water, waste water, air and soil Quality
- **Compare** the water, air quality standards with prescribed standards set by the local governments
- **Develop** a report on the quality aspect of the environment

Text/Reference Books:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey. 2. Introduction to Environmental Engineering by P. AarneVesilind, Susan M. Morgan, Thompson   /Brooks/Cole; Second Edition 2008.

3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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COMPUTER AIDED CIVIL ENGINEERING DRAWING

Pre-Requisites: Computer Aided Civil Engineering Drawing or AUTO CAD Principles –Excel-Structural Engineering -1 & 2

Course Objectives : The objectives of the course are to
- **Learn** the usage of any fundamental software for design
- **Create** geometries using pre-processor
- **Analyse**and Interpret the results using post processor
- **Design** the structural elements

LIST OF EXPERIMENTS

1. Analysis &Design determinate structures using a software

2. Analysis &Design of fixed & continuous beams using a software

3. Analysis & Design of Plane Frames

4. Analysis &Design of space frames subjected to DL & LL

5. Analysis &Design of residential building subjected to all loads (DL,LL,WL,EQL)

6. Analysis & Design of Roof Trusses

7. Design and detailing of built up steel beam

8. Developing a design programme for foundation using EXCEL Spread Sheet

9. Detailing ofRCC beam and RCCslab

10. Detailing of Steel built up compression member

Course Outcomes

After the completion of the course student should be able to
- **Model** the geometry of real world structure Represent the physical model of structural element/structure
- Perform **analysis**
- **Interpret** from the Post processing results
- **Design** the structural elements anda system as per IS Codes

Note: Drafting of all the exercises is to be carried out using commercially available designing software's.

IV Year B.Tech. Civil Engg. I-Sem

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ESTIMATION, COSTING AND PROJECT MANAGEMENT

Course Objectives: The subject provide process of estimations required for various work in construction.To have knowledge of using SOR & SSR for analysis of rates on various worksand basics of planning tools for a construction projects.

UNIT – I
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Detailed Estimates of Buildings

UNIT – II
Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.

UNIT – III
Rate Analysis – Working out data for various items of work over head and contingent charges.

UNIT-IV
Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation - Standard specifications for different items of building construction.

UNIT-V
Construction project planning- Stages of project planning: pre-tender planning,pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.

Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion

NOTE : NUMBER OF EXERCISES PROPOSED :
      1.   Three in flat Roof & one in Sloped Roof
      2.   Exercises on Data – three Nos.

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

- understand the technical specifications for various works to be performed for a projectand how they impact the cost of a structure.
- quantify the worth of a structure by evaluating quantities of constituents, derive theircost rates and build up the overall cost of the structure.
- understand how competitive bidding works and how to submit a competitive bidproposal.
- An idea of how to optimize construction projects based on costs
- An idea how construction projects are administered with respect to contract structures and issues.
- An ability to put forward ideas and understandings to others with effective communication processes

Text Books
1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, LaxmiPublications, 2016

Reference books:
1. Estimating and Costing by G.S. Birdie
2. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014\
3. Standard Schedule of rates and standard data book by public works department.
4. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
5. Estimation, Costing and Specifications   by M. Chakraborthi; Laxmi publications.
6. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**

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PROFESSINAL PRACTICE LAW & ETHICS (AS Per AICTE Syllabus)

Course Objective:-
- To make the students understand the types of roles they are expected to play in the society aspractitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession

Course Outcomes
- To familiarize the students to what constitutes professional practice, introduction of various
- stakeholders and their respective roles; understanding the fundamental ethics governing the profession
- To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour
- To give an understanding of Intellectual Property Rights, Patents.
- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop good ideas of the legal and practical aspects of their profession

Unit -I

Unit I A- Professional Practice – Respective roles of various stakeholders:
Government(constituting regulatory bodies and standardization organizations, prescribing norms to ensure safetyof the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice);professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI,
Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction);Clients/ owners (role governed by contracts); Developers (role governed by regulations such asRERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by
contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (rolegoverned by contracts and regulatory Acts and Standards)

Unit I B- Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website ofInstitution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

Unit II:
General Principles of Contracts Management: Indian Contract Act, 1972 and amendmentscovering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and subcontracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction;

Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms;

Unit III :
Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law –Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

Unit IV:
Engagement of Labour, and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act,1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

Unit V:
Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet –Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

Reference Books
1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.

2. The National Building Code, BIS, 2017

3. RERA Act, 2017

4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset

5. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash

Publications

   Mumbai

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
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MINI PROJECT / INTERNSHIP

A) There shall be an Industrial oriented Mini Project in Collaboration with an Industry of the relevant specialization to be registered immediately after III Year II Semester Examinations and taken up during the summer vacation for about eight weeks duration.

B) The industry oriented Mini-Project shall be submitted in a report form, and a presentation of the same shall be made before a Committee, which evaluates it for 100 marks. The committee shall consist of Head of the Department, the supervisor of Mini-Project, and a Senior Faculty Member of the Department. There shall be no internal marks for Industry oriented Mini-Project. The Mini-Project shall be evaluated in the IV year I Semester.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. I-Sem   **L T P C**
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PROJECT STAGE – I

Each Student shall start the project work during the IVth Year –I Semester as per the instructions of the of the Project Guide/Project Supervisor assigned by the HEAD Of The DEPARTMEN. Out of a total 200 marks allotted for the Project Work, 60 marks shall be for CIE(Continuous Project Evaluation) and 140 marks for SEE(End Semester Viva –Voce Examination.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. I-Sem   **L T   P   C**
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SEMINAR

There shall be a Seminar Presentation in IV Year II Semester.

For the seminar, the student shall collect the information on a specialized topic, prepare a Technical Report and Submit to the Separtment at the time of Seminar Presentation. The Seminar Presentation (along with the Technical Report) shall be evaluated by two faculty members assigned by the Head of the Department, for 100 marks. There shall be SEE or external Examination for Seminar

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem   **L T P C**
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PROJECT STAGE - II

The Project Viva –Voce shall be conducted by a committee comprising of an External Examiner, Head of the Department and Project Supervisor. Out of 60 marks allocated for CIE, 30 marks shall be awarded by the Project Supervisor (based on the Continuous Evaluation of Student's Performance throught the Project work period) and the other 30 marks Shall be awarded by a Departmental Committee Consisting of Head of the Department and Project Supervisor, based on the work carried out the presentation made by the Student at the time of Viva –Voce Examination

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem
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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)
CONCRETE TECHNOLOGY

Pre Requisites: Building Materials

Course Objectives: The objectives of the course are to

- **Know** different types of cement as per their properties for different field applications.
- **Understand Design** economic concrete mix proportion for different exposure conditions and intended purposes.
- **Know** field and laboratory **tests** on concrete in plastic and hardened stage.

UNIT I
CEMENT: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures:Types of admixtures – mineral and chemical admixtures.

UNIT - II
AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.

UNIT – III
FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT - IV
HARDENED CONCRETE : Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests– Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

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

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

SPECIAL CONCRETES: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Course Outcomes:

After the completion of the course student should be able to

- **Determine** the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
- **Apply** the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
- **Use** advanced laboratory techniques to characterize cement-based materials.
- **Perform** mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.

Text books:
1. Concrete Technology by M.S.Shetty. – S.Chand& Co. ; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford university Press, New Delhi

References:
1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2.Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers
3. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

IS Codes:

IS 383
IS 516

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem
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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)

Finite Element Method for Civil Engineering

Pre Requisites: SA – I & SA – II

Course Objectives: To introduce the numerical method FEM and its features with the help of simple problem.

Course Outcomes: Understand the principles, procedure and applicability of FEM in Civil Engineering problem.

UNIT – I
Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.

UNIT – II
Lagrangian – Serendipity elements – Hermite polynomials – regular, Irregular 2 D & 3D – Element –shape functions upto quadratic formulation.
Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain relation

UNIT – III
FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.

UNIT – IV
FEA Two dimessional problem – CST – LST element – shape function – stress – strain.
Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis -formulation of CST element.

UNIT-V
Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.
2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India

REFERENCES:
1. Finite Element Aanalysis by P.Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook *et al.*, Wiley India Pvt. Ltd.
3. Applied Finite Element Analysis by G.Ramamurty, I.K.International Publishing House Pvt. Ltd.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem

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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)

EARTHQUAKE ENGINEERING

Objectives:
To impart knowledge on the seismology and behavior of buildings during earthquakes.

Outcomes : The learner will be able to analyse and design buildings to resist seismic forces.

UNIT - I
Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics-Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India.

Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength - Seismic design requirements-regular and irregular configurations-basic assumptions.

UNIT II
Conceptual design: Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel.

Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT III
Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members-Structural models for frame buildings- Seismic methods of analysis- Seismic deign methods- IS code based methods for seismic design- Seismic evaluation and retrofitting- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT IV

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT V
Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage- Isolation of non-structures. Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behaviour of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes.

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCES:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Eartquake Resistant Design of Buidling structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K.International Publishing House Pvt. Ltd.
4. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nem chand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction
   a. C.V.R. Murthy

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)

INTRODUCTION TO OFFSHORE STRUCTURES

UNIT I
Types of offshore structures .selection .function - Physical, environmental and geotechnical aspects of marine and offshore construction . Loads and responses of offshore structures.Foundations for offshore structures . Introduction to design and installation of offshore piled platforms,concrete offshore platforms, Moored floating structures and Submarine pipelines

UNIT II
WAVE THEORIES
Wave generation process, small and finite amplitude wave theories.

UNIT III
FORCES OF OFFSHORE STRUCTURES
Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.
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UNIT IV
OFFSHORE SOIL AND STRUCTURE MODELING
Different types of offshore structures, foundation modeling, structural modeling.

UNIT V
ANALYSIS AND DESIGN OF OFFSHORE STRUCTURES
Static method of analysis, foundation analysis and dynamics of offshore structures. Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

Text Books
1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structuresMcGraw Hill Book co.
3. Chakrabarti.,S.K., Hand Book of Offshore Engineering (Vols. 1 & 2)" ElsevierPublications

References
1. Brebbia C.A. and Walker, 'Dynamic Analysis of Offshore Structures', Newnes Butterworth, London, 1978.
2. Sarpakaya T and Isaacson M., 'Mechanics of Wave Forces on Offshore Structures', Van Nostrand Reinhold, New York, 1981.

3. Hallam M.G., Heaf N.J. and Wootton, L.R., 'Dynamics of Marine Structures', CIRIA Publications, Underwater Engg., Group, London, 1978.
4. Graff W.J., 'Introduction to Offshore Structures', Gulf Publishing Co., Houston, Texas, 1981.
5. Clough R.W. and Penzien J., 'Dynamics of Structures', II Edition, McGraw-Hill, 1992.
6. Simiu E. and Scanlan R.H., 'Wind Effects on Structures', Wiley, New York, 1978.
7. Codes of Practices (latest versions) such as API RP-2A, Bureau Veritas etc.
8. Proceedings of Offshore Technology Conference (O.T.C.), Behaviour of Offshore Structures (BOSS) and other Conferences on Offshore Engineering.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem   **L T P C**

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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)
PRESTRESSED CONCRETE

Pre-Requisites: Reinforced Concrete Design
Course Objectives
The objectives of the course are to
- Understand theprinciples &necessity of prestressed concrete structures.
- Know different techniques of prestressing.
- Get the knowledge on various losses of prestress.
- Understand Analysis and design of prestressed concrete members.

UNIT I:
Introduction: Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.

UNIT II:
Methods and Systems of prestressing: Pretensioning and Posttensioning methodsand systems of prestressing like Hoyer system, MagnelBlaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.**Losses of Prestress:** Loss of prestress in pretensioned and posttesnioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

UNIT III:
Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.
Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions**.**

UNIT IV:
Transfer of Prestress in Pretensioned Members : Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses

in post tensioned members – stress   distribution in End   block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions

UNIT V
Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.
Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

Course Outcomes
After the completion of the course student should be able to
- Acquire the knowledge of evolution of process of prestressing.
- Acquire the knowledge of various prestressing techniques.
- Develop skills in analysis design of prestressed structural elements as per the IS codal provisions

References :

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co.   New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. RamamruthamDhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem   L T   P C
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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)
BRIDGE ENGINEERING

Pre Requisites: Structural Engineering, Soil Mechanics & Foundation Engineering and Water Resources Engineering

Course Objectives: To study different types of bridges, forces that act on bridges ,Design of bridge

Course Outcomes: To study different types of bridges, forces that act on bridges, Design of bridge.

UNIT-I
Introduction:
Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations and essential design data.
Standard Specifications for Roads and Railways Bridges:
General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.

UNIT-II
Design Consideration for R. C. C. Bridges:
Various types of R.C.C. bridges (brief description of each type) , design of R.C.C. culvert and T-beam bridges.

UNIT-III
Design Consideration for Steel Bridges:
Various types of steel bridges (brief description of each), design of truss and plate girder bridges.

UNIT-IV
Hydraulic & Structural Design:
Piers, abutments, wing-wall and approaches.
Brief Description: Bearings, joints, articulation and other details.
UNIT -V
Bridge Foundation:
Various types, necessary investigations and design criteria of well foundation.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1   Essentials of Bridge Engineering, D.J.Victor, Oxford & IBH Pub.N.Delhi.
2   Design of Bridges, N.Krishna Raju, Oxford & IBH, N.Delhi.
3   Bridge Deck Analysis, R.P.Pama & A.R.Cusens, John Wiley & Sons.
4   Design of Bridge Structures, T.R.Jagadish & M.A.Jairam, Prentice Hall of India, N.Delhi.

III Year B.Tech. Civil Engg. II-Sem   **L T P C**
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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)

OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING

UNIT 1
Introduction to Optimization: Introduction - Historical developments - Engineering applications of Optimization - Statement of an Optimization problem - Classification of Optimization problems - Optimization Techniques. Optimization by calculus: Introduction - Unconstrained functions of a single variable - Problems involving simple constraints - Unconstrained functions of several variables - treatment of equality constraints - Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

UNIT II
Linear Programming: Introduction - Applications of linear programming - standard form of a linear programming problem - Geometry of linear programming problems - Definitions and theorems - Solution of a system of Linear simultaneous equations - Pivotal reduction of a general system of equations - Motivation of the Simplex Method - Simplex Algorithm - Two phases of the simplex method. non-Linear Programming: Introduction - Unimodal Function - Unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method - Fibonacci method - Golden section method - Comparison of elimination methods - Unconstrained optimization techniques - Direct search methods - Random search methos - grid search method - Univariate method - Powell's method - Simplex method - Indirect search methods - Gradient of a function - Steepest descent method - Conjugate gradient - Newton's method.

UNIT III
Dynamic Programming: Introduction - Multistage decision processes - concept of sub-optimization and the principle of optimality - computational procedure in dynamic programming - example illustrating the Calculus method of solution - example illustrating the Tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming - Additional applications.

UNIT IV
Network Analysis: Introduction - Elementary graph theory - Network variables and problem types - Minimum-cost route - Network capacity problems - Modification of the directional sense of the network.

UNIT V
Application of Optimization techniques to trusses, Beams and Frames.

Text Books:

1. Introduction to Optimum Design by J.S.Arora. McGraw Hill New York

2. Optimization: Theory and Applications by S.S.Rao.Wiley & Sons

References

1. Numerical Optimization Techniques for Engineering Design with applications by G.N.Vanderplaats. McGraw-Hill, New York

2. Elements of Structural Optimization by R.T.Haftka and Z.Gurdal. Kluwer Academic Publishers, Dordrecht, 1992

3. Optimum Structural Design by U.Kirsch. McGraw-Hill, New York

4. Optimum Design of Structures by K.I.Majid. Wiley, New York

III Year B.Tech. Civil Engg. II-Sem
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PROFESSIONAL ELECTIVE
(STRUCTURAL ENGG STREAM)
INTROUDUCTION TO COMPOSITE MATERIALS

UNIT - I
Introduction: Requirements of structural materials, influence of nature of materials in structural form, Nature of structural materials- Homogeneous materials, composite materials.

UNIT - II
Macro mechanical Properties of composite Laminae: Introduction, Assumptions and Idealizations, Stress Strain relationships for composite Laminae- Isotropic, Orthotropic laminae, Strength Characteristics- Basic concepts, Strength hypothesis for isotropic and Orthotropic laminae. Macro mechanical Analysis of composite Laminae: Introduction, Assumptions and Limitations, Stiffness characteristics of glass reinforced laminae-   Stress- Strain relationships in continuous, discontinuous fibre laminae, Strength   characteristics of glass reinforced laminae- Strengths in continuous, discontinuous fibre   laminae.

UNIT - III
Behaviour of Glass Fibre-Reinforced laminates: Introduction, Stiffness characteristics of Laminated composites-Behaviour of Laminated beams and plates, Strength characteristics of Laminated composites- Strength analysis and failure criteria, Effect of inter laminar structures. Glass Reinforced Composites: Introduction, Continuously reinforced laminates- uni-directionally and multi directionally continuously reinforced laminates, Discontinuously reinforced laminates – Stiffness and Strength properties.

UNIT - IV
GRP properties relevant to structural Design: Introduction, Short-term strength and stiffness-Tensile, Compressive, Flexural and Shearing. Long term strength and   stiffness properties, Temperature effects, Effect of fire, Structural joints- Adhesive,   mechanical, Combinational, Transformed sections.

UNIT - V
Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performance- Modulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.
Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

Text book
1.   GRP in Structural Engineering M.Holmes and D.J.Just.
       Mechanics of Composite materials and Structures by Madhujith Mukhopadhyay; Universities Press

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem   **L T P C**

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PROFESSIONAL ELECTIVE
(TRANSPORTATION ENGG STREAM)
PAVEMENT DESIGN

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Pre Requisites: Transportation Engineering

Course Objectives: The study factors affecting pavement design, material characteristics , design of flexible, rigid pavements and low volume roads.

Course Outcomes: Able to design pavement

UNIT – I
Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II
Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses In Flexible Pavements**: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts.**Stresses In Rigid Pavements**: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

UNIT – III
Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics.

UNIT - IV

Design Of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods

Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT – V

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, Rural road designs – code of practice. **Design of Overlays**: Types of Overlays, Suitability, Design of overlays.

Text Books:
1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc

References:
1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes for Flexible and Rigid Pavements design

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem
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PROFESSIONAL ELECTIVE
(TRANSPORTATION ENGG STREAM)

TRAFFIC ENGINEERING

Pre Requisites: Transportation Engineering

Course Objectives: To provide engineering techniques to achieve the safe and efficient movement of people and goods on roadways.

Course Outcomes: To provide engineering techniques to achieve the safe and efficient movement of people and goods on roadways.

Unit 1: Traffic Studies (Part- I) : Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Statistical Methods for speed data Analysis, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.

Unit 2: Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Accident studies- Causative factors of Road accidents, Accident data collection: Accident analysis and modeling;, Road Safety Auditing, Measures to increase Road safety.

Unit3: Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS, Capacity of Urban/Rural Highway, With or without access control, Basic freeway segments - Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.

Unit4: Signal Designing – Fixed Time signals, Determination of Optimum Cycle length and Signal setting for Fixed Time signals, Warrants for Signals, Time Plan Design for Pre-Timed Control- Lane group analysis, Saturation flow rate, and Adjustment factors, Uniform and Incremental Delay, Vehicle Actuated Signals, Signal Coordination.

Unit5: Transportation System Management - Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes- Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

References:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski,   John Wiley & Sons Publication
3. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India.
4. IRC Codes
5. Traffic Engineering - Theory & Practice - Louis J.Pignataro, Prentice Hall Publication.
6. Traffic Engineering by Roger P.Roess, William R. Mc. Shane, Elena S.Prassas , Prentice Hall,1977.
7. Transportation   Engineering - AnIntroduction - C.Jotin Khisty, Prentice Hall Publication
8. Fundamentals of Traffic Engineering – McShane & Rogers.
9. Highway Capacity Manual -2000.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem　　　　　　　　　**L　T　P　C**

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PROFESSIONAL ELECTIVE
(TRANSPORTATION ENGG STREAM)

URBAN TRANSPORTATION ENGINEERING

Objectives:
* The course introduces students to the fundamentals of Urban transportation engineering
* It familiarizes students with contemporary transportation planning issues and methods of analysis.

Course Outcomes:

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

* Identify urban transportation problems.
* Estimate urban travel demand.
* Plan urban transport networks.
* Identify urban transport corridors.
* Prepare urban transportation plans

Unit I:

Introduction: Fundamentals of transportation , Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems

Unit II:

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

Unit III:

Travel Demand issues: Travel Attributes, Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

Unit IV:

Demand and supply planning Plan Preparation And Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis

Unit V:

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

Text book1.

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

References:

1. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers
2. Lecture notes on UTP - Prof. S. Raghavachari , R.E.C.Warangal.
3. Metropolitan transportation planning – John W. Dickey, Tata Mc Graw Hill, New Delhi,1975.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. I-Sem　　　　　　　　　　　　　　**L　T　P　C**
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PROFESSIONAL ELECTIVE
(HYDRAULIS AND WATER RESOURCES STREAM)

PORT & HARBOR ENGINEERING

UNIT .I

Growth and regulation of Ports: History of Port . Classification of Harbours - Factors affecting the growthof Port. - Requirement of a Harbour - General Planning . Port capacity .traffic analysis - Berth occupancy .financial evaluation - EIA -Description of selected Indian ports.

UNIT . II

Harbour Planning (Technical) Site investigation .harbour entrance - Navigational Channel . Depth of harbour . Turning basin . Anchor basin .berthing area . Storage area - Shipping terminal facilities .Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals.

UNIT-III

Introduction to ocean waves . Wave transformation . Wave and wind climate inside Harbour – Break waters: Types . Factors determining their selection . Forces on break waters . Design of rubble mound and vertical break waters . Physical Model Studies.

UNIT-IV

Berthing structures .Types .Loads . Selection of berthing structures . Design principles of diaphragm walls, dolphins and piles. Selection and Design principles of Dock fenders and Mooring accessories.

UNIT . V

Design principles of dock structures - Graving dry dock . Slip way .floating dry dock - Monitoring and repair of harbour structures - Dredging - Navigational aids . Light house.

TEXT BOOKS

1. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.
2. Oza and Oza, "A course in Docks & Harbour Engineering".

REFERENCES

1. Harbour and Coastal Engineering (Indian Scenario) Vol - I &Vol . II; S. Narasimhan & S. kathiroli, NIOT- Chennai
2. Design and construction of Port and marine Structures . Alonzo Def. Quinn .McGraw . Hill book Company
3. IS: 7314 1974 - Glossary of terms relating to Port and harbour Engineering.
4. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part . I) Site Investigation.
5. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part . II) Earth Pressure.
6. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part . III) Loading.
7. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part . IV) General Design Consideration.
8. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part . V) Layout and functional Requirement.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. I-Sem   **L T   P C**
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PROFESSIONAL ELECTIVE
(HYDRAULIS AND WATER RESOURCES STREAM)

DESIGN AND DRAWING OF IRRIGATION STRUCTURES

Design and drawing of the following hydraulic structures

Group A

1. Surplus weir.

2. Syphon Well Drop

3. Trapezoidal notch fall.

4. Tank sluice with tower head

Group B

1. Sloping glacis weir.

2. Canal regulator

3. Under Tunnel.

4. Type III Syphon aqueduct

Final Examination pattern:

The Question paper is divided into two parts with two questions in each part. The student has to answer ONE question from each part. Part I should cover the designs and drawings from Group A for 45 marks and Part II should cover only designs from group B carrying 30 marks.

The duration of examination will be FOUR hours.

However, the students are supposed to practise the drawings for Group B structures also for internal evaluation.

TEXT BOOKS:

1. Water Resources Engineering – Principles and Practice by Challa Satyanarayana Murthy, New Age International Publishers.

2. Irrigation engineering and Hydraulic structures by S.K.Garg, Standard Book House.

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IV Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
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PROFESSIONAL ELECTIVE
(HYDRAULIS AND WATER RESOURCES STREAM)

GROUND WATER DEVELOPMENT AND MANAGEMENT

UNIT – I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT – II

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT – III

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupuit's and Theim's equations, Assumptions, Formation constants, yield of an open well Well interface and well tests – Recuperation Test.

UNIT – IV

Unsteady flow towards a well – Non equilibrium equations – Theis' solution – Jocob and Chow's simplifications, Leaky aquifers – Well Interference.

UNIT – V

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

TEXT BOOKS:
1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

REFERENCES :
1. Groundwater Hydrology by BOWER, John Wiley & sons.
2. Groundwater System Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.

IV Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**

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PROFESSIONAL ELECTIVE
(HYDRAULIS AND WATER RESOURCES STREAM)

STOCHASTIC HYDROLOGY

Pre Requisites: WRE

Course Objectives: Understanding probabilities interventions of dynamics characteristic of water

Course Outcomes: Water Resources – I & Probability statistics

Deterministic and Stochastic Hydrology, Need for statistical methods in hydrology, Continuous and Discrete

distributions, Moments and expectations, Parameter estimation, Probability plotting, Regional flood frequency

analysis, Hypothesis Testing, linear regression, Hydrologic Time Series Analysis - Modeling of Hydrologic

Time Series - Data generation techniques, Autoregressive processes and models for operational hydrology.

Reading:

1. Charles T. Haan, Statistical Methods in Hydrology, East West Publishers, 1998.

2. Jaya Rami Reddy, Stochastic Hydrology, Laxmi Publications, 1997.

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IV Year B.Tech. Civil Engg. I-Sem   **L   T   P   C**
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PROFESSIONAL ELECTIVE
(ENVIRONMENTAL ENGG STREAM)
GEO ENVIRONMENTAL ENGINEERING

Pre Requisites: Soil Mechanics & Environmental Engineering

Course Objectives: 1. To study the sources of contamination and characterization of contaminated ground.
2. To study and model the contaminable Transport.
3. To identify appropriate remediation technique for the contaminated.

Course Outcomes: Able to identify appropriate remediation techniques for contaimination & provide models

Unit. I
Sources and Site Characterization: Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

Unit. II
Solid and Hazardous Waste Management: Classification of waste, Characterisation solid wastes, Environmental Concerns with waste, waste management strategies.

Unit. III
Contaminant Transport: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

Unit. IV
Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

Unit. V
Landfills: Types oflandfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

Text Books
1. Bedient, Refai & Newell - Ground Water Contamination
2. Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering

References:
1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Handbook
2. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering
3. LaGrega, M. D., Buckingham, P. L. and Evans, J. C. - Hazardous Waste Management

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. I-Sem

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PROFESSIONAL ELECTIVE
(ENVIRONMENTAL ENGG STREAM)
Environmental Engineering -II

UNIT – I

Air Pollution – sources of pollution – Classification – effects on human beings – Global effects of Air pollution.

UNIT – II

Air pollution Control Methods – Particulate control devices – General Methods of Controlling Gaseous Emission,Special Treatment Methods – Adsorption – Reverse Osmosis – Defluoridation – Ion exchange – Ultra Filtration.

UNIT –III

Theories industrial waste treatment – Volume reduction – strength reduction – Neutralization – Equalization – Proportioning – Nitrification and Denitrification – Removal of Phosphates.

UNIT – IV

Solid waste Management – sources, composition and properties of solid waste – collection and handling – separation and processing,Solid waste disposal methods – Land filling – Incineration composting.

UNIT – V

Hazardous Waste – Nuclear waste – Biomedical wastes – chemical wastes – Effluent – disposal and Control methods,Noise Pollution – effects of noise and control methods – Effluent standards – Air emission standards – Water Act – Air Act – Environment Protection Act.

TEXT BOOKS:

1. Environmental Science and Engineering by J.G.Henry and G.W.Heinke – Person Education.
2. Environmental Engineering and Management – Dr.Suresh K.Dhameja – S.K.Kartarai & Sons 2nd Edition 2005.

REFERENCES:

1. Physico – Chemical process for waster quality control by Weber
2. Air Pollution and Control by MN Rao & H.N.Rao

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IV Year B.Tech. Civil Engg. II-Sem   L   T   P   C
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PROFESSIONAL ELECTIVE
(GEOTECHNICAL ENGG STREAM)
GROUND IMPROVEMENT TECHNIQUES

Prerequisites: Geo-Technical Engineering, Foundation Engineering

Course Objectives: The objectives of the course are

- To know the need of ground improvement
- To acquire the knowledge on the various ground improvement techniques available and their applications for different types of soils
- To understand suitable ground improvement technique for given soil conditions.

UNIT I:
Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.

UNIT II:
Mechanical Modification: Shallow Compaction Techniques- Deep Compaction Techniques- Blasting- Vibrocompaction- Dynamic Tamping and Compaction piles.

UNIT III:
Hydraulic Modification: Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering-Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains.

UNIT IV:
Physical and Chemical Modification – Modification by admixtures, Modification Grouting,Introduction to Thermal Modification including freezing.

UNIT V:
Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

Course Outcomes: at the end of the course the student able to

- Know the necessity of ground improvement

- Understand the various ground improvement techniques available

- Select & design suitable ground improvement technique for existing soil   conditions in

   the field

Text Books

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis

References:

1. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey
2. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
3. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
4. K. Krisch& F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
5. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**

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PROFESSIONAL ELECTIVE
(GEOTECHNICAL ENGG STREAM)

SOIL DYNAMICS AND MACHINE FOUNDATIONS

OUTCOME:

➢ Students understands theory of vibration and resonance phenomenon,
    Amplification.

➢ Students understand propagation of body waves and surface waves through soil.
➢ Student exposed to different methods for estimation of dynamic soil properties required for
    design purpose.
➢ Students can predict dynamic bearing capacity and assess liquefaction potential of any site.
➢ Students apply theory of vibrations to design machine foundation based on dynamic soil
    properties and bearing capacity.

UNIT- I

Fundamentals of Vibration: Definitions, Simple harmonic motion, Response of SDOF systems of Free
and Forced vibrations with and without viscous damping, Frequency dependent excitation, Logarithmic
decrement, Determination of viscous damping, Systems with Two and Multiple degrees of freedom,
Vibration measuring instruments.

UNIT- II

Wave Propagation and Dynamic Soil Properties: Propagation of seismic waves in soil deposits -
Attenuation of stress waves, Stress-strain behavior of cyclically loaded soils, Dynamic soil properties -
Laboratory and field testing techniques, Elastic constants of soils, Correlations for shear modulus and
damping ratio in sands and clays.

UNIT- III

Foundation Vibration Analyses: Types, General Requirements, Permissible amplitude, Allowable soil
pressure, Modes of vibration of a rigid foundation block, Vertical vibration of circular foundations resting
on Elastic Half Space- Lambs, Reissner, Quinlan & Sungs analogies.

UNIT- IV

Design of Machine Foundations: Analysis and design of block foundations for reciprocating engines, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques.

UNIT- V

Machine Foundations on Piles: Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Design procedure for a pile supported machine foundation.

REFERENCE:

1. Swami Saran - Soil Dynamics and Machine Foundation, Galgotia Publications Pvt. Ltd. (2010)
2. Prakash, S. - Soil Dynamics, McGraw Hill Book Company (1981)
3. I.Chowdhary and S P Dasgupta - Dynamics of Structures and Foundation, 2009.
4. Arya, S. D, O'Neil, M. and Pincus, G.- Design of Structures and Foundations for Vibrating Machines, Gulf Publishing Co., 1979.
5. Prakash, S. and Puri, V. K. - Foundation for Machines: Analysis and Design, John Wiley & Sons, 1998.
6. Kameswara Rao, N. S. V. - Vibration Analysis and Foundation Dynamics, Wheeler Publication Ltd., 1998.
7. Richart, F. E. Hall J. R and Woods R. D. - Vibrations of Soils and Foundations, Prentice Hall Inc., 1970.
8. Das, B. M. - Principles of Soil Dynamics, PWS KENT publishing Company, Boston.2002
9. Bharat Bhushan Prasad – Advanced Soil Dynamics and Earthquake Engineering, PHI Learning Pvt. Limited, New Delhi, 2011.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem   **L T P C**
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PROFESSIONAL ELECTIVE
(GEOTECHNICAL ENGG STREAM)

ADVANCED FOUNDATION ENGINEERING

OUTCOME:

  ➢ Able to plan and select the soil exploration methods
  ➢ Determine the Bearing capacity of Soil and sellements for the design of shallow foundations
  ➢ To design the deep foundations under different loading conditions
  ➢ To design the foundations on problematic soils and reliability based design for shallow and deep
    foundations

UNIT- I

Soil Exploration: Exploration Methods; Planning the Exploration Program; Boring and Sampling; In Situ
Tests: Standard & Cone Penetration Tests, Field Vane & Borehole shear tests, Dilatometer,
Pressuremeter; Rock Sampling, Core Recovery, RQD; Geophysical Exploration; Preparation of Soil
Report.

UNIT- II

Shallow Foundations: **Bearing Capacity:-** General Formulae; Effect of Water Table; Footings with
eccentric or Inclined Loads, Foundations on Layered Soils, on finite layer with a Rigid Base at Shallow
Depth, effect of compressibility of soil.

UNIT- III

Settlement: Components – Immediate, Consolidation & Creep, Stresses and Displacements in
Homogeneous, Layered and Anisotropic Soils; Consolidation Settlement; One, Two & Three
Dimensional Consolidation; Secondary Compression Settlement; Bearing Pressure using SPT, CPT,
Dilatometer and Pressuremeter; Settlement of foundations on Sands-Schmertmann and Burland &
Busbridge methods; Structure Tolerance to Settlement and Differential Settlements, Rotation of Tall
Structures.

UNIT- IV

Deep Foundations: **Single Pile:** Vertically loaded piles, Static capacity α, β and λ Methods, Dynamic
formulae; Point Bearing Resistance with SPT and CPT Results; Bearing Resistance of Piles on Rock;
Settlement; Pile Load Test; Uplift Resistance; Laterally Loaded Piles -Ultimate Lateral Resistance;
Negative Skin Friction; Batter Piles; Under Reamed Piles; Ultimate Capacity of Pile Groups in

Compression, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups; Interaction of Axially & Laterally Loaded Pile Groups.

UNIT- V

Special Topics of Foundation Engineering

Foundations on Collapsible Soils: Origin and occurrence, Identification, Sampling and Testing, Preventive and Remedial measures.

Foundations on Expansive Soils: The nature, origin and occurrence, Identifying, testing and evaluating expansive soils, typical structural distress patterns and Preventive design & construction measures.

Introduction to Reliability-Based Design: Methods, LRFD for structural strength requirements, LRFD for geotechnical strength requirements, Serviceability requirements.

REFERENCE:

1. Das, B. M. - Principles of Foundation Engineering 7th Cengage Learning (2013)
2. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012. Phi Learning (2008)
3. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
4. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john wiley & sons inc (1980-08)
5. Reese, L. C. & Van Impe, W. F. - Single Piles and Pile Groups under Lateral Loading -Taylor & Francis Group (Jan 2000)
6. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003)
7. Lymon C. Reese, William M. Isenhower, Shin-Tower Wang- Analysis and Design of Shallow and Deep Foundations (2006)
8. Salgado, R. - The Engineering of Foundations McGraw-Hill, Boston (2008)

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem	L	T	P	C
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PROFESSIONAL ELECTIVE
(GEOTECHNICAL ENGG STREAM)

GEOTECHIQUES FOR INFRA STRUCTURE

Unit – I

Site Investigation for Infrastructure Projects: methods of site investigation, types of soil samples and samplers- Geotechnical field testing – SPT, CPT, Plate Load Test, Pile Load Test.

Unit – II

Foundations for Railway & Highway Bridges: types of foundations, design forces, safe and allowable bearing capacity of shallow foundations, settlement computation; Pile foundations – types, axial and lateral capacity of pile, pile group analysis and pile cap; Drilled Piers & Caissons – introduction, drilled piers, caissons, well foundations, bearing capacity and lateral stability aspects, well sinking.

UNIT – III

Introduction to Marine and offshore Structures

Introduction, types of marine and offshore structures, break waters, jetties, berthing structures, groins, gravity platforms, jackup platforms and jacket platform.

Unit – IV

Foundations for Transmission Line, Radar Antenna, Microwave and TV Tower and Chimneys:

Introduction, foundations for towers and chimneys, design forces, behaviour of pad and chimney foundations, design of chimney and pad foundations, anchor foundations (rock anchors), design of foundations for towers and chimneys, design and construction of shallow foundations on rocks.

UNIT – V

Machine foundations – Introduction - types of machines, types of foundations for machines, allowable stresses and amplitudes and general design guidelines of foundation for machines.

Excavation Schemes: Sheet Piles - introduction, types of sheet pile walls, cantilever sheet pile wall, anchored sheet pile wall, stability analysis of anchored bulkhead by free earth support and fixed earth support method, position of anchorage; Braced Excavations- methods used for shallow and deep open cuts, design pressure and procedures for bracings of cuts; Cellular Cofferdams – types and uses.**Difficult Soils & Improvement Techniques**:

Difficult soils- loose granular soils, soft clays and shrinkable soils – identification, swell and swell pressure, principles of soil stabilisation techniques, vibro replacement and vibro compaction techniques.Introduction to forensic Geotechnical Engineering and some case studies.

Text Books

1. Foundation analysis and design – J. E Bowles, McGraw Hill Book Company
2. Foundation Engineering – P. C. Varghese, Prentice Hall of India.

References:

1. Design of Foundation Systems Principles and Practices – N. P. Kurian, Narosa Publishing House.
2. Principles of Foundation Engineering – B. M. Das, CENGAGE Learning, Thomson, Brooks/Cole.
3. Soil Mechanics and foundation engineering – P. Purushottama Raj, Pearson Education.
4. Construction of marine and offshore structures – Ben C Gerwick, jr., CRC Press, Taylor and Francis Group.
5. Analysis and design of foundations and retaining structures – Shamsher Prakash, Gopal Ranjan and Swami Saran, Sarita Prakasan.
6. Dynamic soil tests and applications – N S V Kameswara Rao, Wheeler Publishing.
7. Pile design and construction practice – M J Tomlinson, View point Publications, Palladian Publications Limited.
    a. IS: 4091 (1979) -Design and construction of foundations for transmission line towers.
8. IS: 11233 (1985) - Design and construction of foundations forRadar Antenna, Microwave and TV Tower.
9. Geotechnical Engineering: Principles and practices of soil mechanics and foundation

Engineering by VNS Murthy, Taylor & Francis Group

Open Elective – I

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**

OPEN ELECTIVE - I

REMOTE SENSING & GIS

Pre Requisites: Surveying

Course Objectives:
The objectives of the course are to
- Know the conceptsof Remote Sensing, its interpreting Techniques and concepts of Digital images
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing thespatial Data Using GIS.
- Understand Implementationof GIS interface for practical usage.

UNIT – I

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT- II:

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing,

UNIT- II:

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

UNIT- III:

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

UNIT- IV: Implementing a GIS and Applications

Implementing a GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS

UNIT- V:

Applications of GIS

GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

Course Outcomes
After the completion of the course student should be able to

- **Describe** different concepts and terms used in Remote Sensing and its data
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- **Evaluate** the accuracy of Data and implementing a GIS
- **Understand the applicability of** RS and GIS for various applications.

TEXT BOOKS

1. Remote Sensing and GIS by BasudebBhatta , Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGrawHill Education (Indian Edition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

REFERENCES

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W.Kiefer, Wiley Publishers, 7th Edition, 2015.\
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.SathiKumar, N.Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy,

JNTUH COLLEGE OF ENGINEERING HYDERABAD

III Year B.Tech. Civil Engg. II-Sem

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OPEN ELECTIVE - I

DISASTER MANAGEMENT

Pre Requisites: NIL

Course Objectives: The subject provide different disasters, tools and methods for disaster management

Course Outcomes: Estimate, perform quantity survey & valuate various engineering works

UNIT 1 : Understanding Disaster
Concept of Disaster
Different approaches
Concept of Risk
Levels of Disasters
Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerability
Natural and man-made hazards; response time, frequency and forewarning levels of different hazards
Characteristics and damage potential or natural hazards; hazard assessment
Dimensions of vulnerability factors; vulnerability assessment
Vulnerability and disaster risk
Vulnerabilities to flood and earthquake hazards

UNIT 2 : Disaster Management Mechanism
Concepts of risk management and crisis managements
Disaster Management Cycle
Response and Recovery
Development, Prevention, Mitigation and Preparedness
Planning for Relief

UNIT 3: Capacity Building
Capacity Building: Concept
Structural and Nonstructural Measures
Capacity Assessment; Strengthening Capacity for Reducing Risk
Counter-Disaster Resources and their utility in Disaster Management
Legislative Support at the state and national levels

UNIT 4: Coping with Disaster
Coping Strategies; alternative adjustment processes
Changing Concepts of disaster management
Industrial Safety Plan; Safety norms and survival kits
Mass media and disaster management

UNIT 5: Planning for disaster management

Strategies for disaster management planning

Steps for formulating a disaster risk reduction plan

Disaster management Act and Policy in India

Organizational structure for disaster management in India

Preparation of state and district disaster management plans

Text Books

1. Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.
2. Carter, W.N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.
3. Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

References

1. Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.
2. Goudie, A. Geomorphological Techniques, Unwin Hyman, London 1990.
3. Goswami, S.C Remote Sensing Application in North East India, Purbanchal Prakesh, Guwahati, 1997.
4. Chakrabarty, U.K. Industrial Disaster Management and Emergency Response, Asian Book Pvt. Ltd., New Delhi 2007.
5. Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
6. National Policy on Disaster Management, NDMA, New Delhi, 2009
7. Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.
8. District Disaster Management Plan-Model Template, NIDM, New Delhi, 2005.
9. Disaster Management, Future challenge and opportunities, Edited by Jagbir singh, I.K. International publishing home Pvt, Ltd.

III Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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OPEN ELECTIVE - I
Nano Technology (Pre –Requisites, Course Objectives & Outcomes Should be included)

UNIT-I

General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

UNIT-II

Silicon Carbide: Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles,

Nano particles of Alumina and Zirconia: Nano materials preparation, Characterization, Wear materials and nano composites,

UNIT-III

Mechanical properties: Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

UNIT -IV

Electrical properties: Switching glasses with nanoparticles,Electronic conduction with nano particles

Optical properties: Optical properties, special properties and the coloured glasses

UNIT-V

Process of synthesis of nano powders, Electro deposition, Important naon materials

TEXT BOOKS:

1. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
2. Nano Essentials- T.Pradeep/TMH

III Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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OPEN ELECTIVE - I
Construction Management (Pre –Requisites, Course Objectives & Outcomes Should be included)

UNIT . I
Management process- Roles .management theories . Social responsibilities .planning and strategic management . strategy implementation . Decision making: tools and techniques – Organizational structure . Human resource management- motivation performance- leadership.

UNIT-II
Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications .Preliminary Planning- Collection of Data-Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

UNIT-III
Resource planning - planning for manpower, materials, costs, equipment. Labour, -Scheduling .Forms of scheduling - Resource allocation .budget and budgetary control methods

UNIT-IV
Contract - types of contract, contract document, specification, important conditions of contract – tender and tender document - Deposits by the contractor - Arbitration .negotiation - M.Book - Muster roll -stores.

UNIT-V
Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction : legal and financial aspects of accidents in construction . occupational and safety hazard assessment. Human factors in safety .legal and financial aspects of accidents in construction . occupational and safety hazard assessment

TEXT BOOKS

1. Ghalot, P.S., Dhir,D.M., Construction Planning and Management, Wiley Eastern Limited,1992.
2. Chitkara,K.K., Construction Project Management, Tata McGraw Hill Publishing Co, Ltd., New Delhi,998.
3. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi,1987.

REFERENCES:
1.Construction Management And Planning by: sengupta, b. /guha, h. tata mcgraw-hill publications

Open Elective - II

IV Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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OPEN ELECTIVE - II

Project Management(Pre –Requisites, Course Objectives & Outcomes Should be included)

UNIT I
Introduction – Definitions – classifications – project risk – scope

UNITII
Project management – definitions – overview – project plan – management principles applied to project management – project management life cycles and uncertainty

UNIT III
Project planning – scope – problem statement – project goals – objectives – success criteria – assumptions – risks – obstacles – approval process – projects and strategic planning

UNIT IV
Project implementation – project resource requirements – types of resources – men – materials – finance

UNIT V
Project monitoring – evaluation – control – project network technique – planning for monitoring and evaluation – project audits – project management information system – project scheduling – PERT & CPM – project communication – post project reviews

TEXT BOOKS:
1. Project Management – for 21st Centrury-Beenet P Lientz, Kathyn
P rea- Academic Press, 1995
2. Project Management –Denislok

REFERENCE BOOKS:
1. Project management - David I Cleland - Mcgraw Hill
International Edition, 1999
2. Project Management – Gopalakrishnan – Mcmillan India Ltd.
3. Project Management-Harry-Maylor-Peason Publication

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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OPEN ELECTIVE - II

ELEMENTS OF EARTHQUAKE ENGINEERING

Pre-Requisites: Structual Engineering –II & RC Design
Course Objectives

The objectives of the course are to
- **Understand** Engineering Seismology
- **Explain** and discuss single degree of freedom systems subjected to free and forced vibrations
- **Acquire** the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes
- **understand** importance of ductile detailing of RC structures

UNIT I
Engineering Seismology: Earthquake phenomenon - cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments seismogram - Seismoscope, Seismograph,-strong ground motions- Seismic zones of India.

Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system-Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

UNIT II
Conceptual design: Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-

framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel.

Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

UNIT III
Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members-Structural models for frame buildings- Seismic methods of analysis- IS code based methods for seismic design- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT IV
Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT V
Structural Walls and Non-Structural Elements: Strategies in the location of structural walls-sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 -Behaviour of beams, columns and joints in RC buildings during earthquakes

Course Outcomes
After the completion of the course student should be able to
- **Explain** and **derive** fundamental equations in structural dynamics
- **Discuss** and **explain** causes and Theories on earthquake, seismic waves, measurement of earthquakes
- **Evaluate** base shear using IS methods
- **Design** and **Detail** the reinforcement for earthquake forces

TEXT BOOKS:
1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCES:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Eartquake Resistant Design of Buidling structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K.International Publishing House Pvt. Ltd.
4. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand& Bros

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem	L	T	P	C
	3	0	0	3

OPEN ELECTIVE - II

CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Pre Requisites: Building Materials & Building Construction

Course Objectives: 1)This subject deals with overall planning, coordination and control of projects.
> 2) This course gives the students scientific principles involved in construction , an understanding of the behavior of construction materials and fundamentals of structural mechanics.

Course Outcomes: Able to perform construction operation planning & management

UNIT -I
Management process- Roles .management theories . Social responsibilities .planning and strategic management . strategy implementation . Decision making: tools and techniques – Organizational structure . Human resource management- motivation performance- leadership.

UNIT-II
Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications .Preliminary Planning- Collection of Data-

Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

UNIT-III
Resource planning - planning for manpower, materials, costs, equipment. Labour, -Scheduling .Forms of scheduling - Resource allocation .budget and budgetary control methods

UNIT-IV
Contract - types of contract, contract document, specification, important conditions of contract – tender and tender document - Deposits by the contractor - Arbitration .negotiation - M.Book - Muster roll -stores.

UNIT-V
Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction : legal and financial aspects of accidents in construction . occupational and safety hazard assessment. Human factors in safety .legal and financial aspects of accidents in construction . occupational and safety hazard assessment

TEXT BOOKS
1. Ghalot, P.S., Dhir,D.M., Construction Planning and Management, Wiley Eastern Limited,1992.
2. Chitkara,K.K., Construction Project Management¸ Tata McGraw Hill Publishing Co, Ltd., New Delhi,998.
3. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi,1987.

REFERENCES:
1. **Construction Management And Planning** by: sengupta, b. /guha, h. tata mcgraw-hill publications

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem   **L T P C**

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OPEN ELECTIVE - II

AIR POLLUTION AND CONTROL

Pre Requisites: Environmental Engineering

Course Objectives: The subject provides the knowledge of various effects of Air pollution on human beings and Vegetation and Materials. The topics of control methods, details of control equipment, the methods of controlling gaseous are also included. The objective of the course is to study the moment, occurrence of ground water and its development and management

Course Outcomes: Able to control the air pollution by properties various techniques to control

UNIT – I
Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution- stationary and mobile sources.

UNIT – II
Effects of Airpollutants on man, material and vegetation; Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT-III
Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SO_x; NO_x; CO; HC etc., air-fuel ratio. Computation and Control of products of combustion.

Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity; Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

UNIT-IV
Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control.

Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

UNIT – V

General Methods of Control of NO_x and SO_x emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Air Quality Management – Monitoring of SPM, SO_x; NO_x and CO Emission Standards.

Text books

1. Air pollution   By   M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.

2. Air pollution by Wark and Warner.- Harper & Row, New York.

Reference:

1. Air pollution and control By K.V.S.G. Murali Krishna, Kaushal Publishers. Kakinada.

Open Elective – III

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem

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OPEN ELECTIVE - III
WASTE MANAGEMENT

Pre Requisites: Environmental Engineering
Course Objectives: To study about waste water treatment
Course Outcomes: Able to provide waste management techniques

UNIT – I
Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT – II
Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems,Industrial waste water discharges into streams. Lakes and oceans and problems.

UNIT – III
Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries,Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods.Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT - IV
Manufacturing Process and design origin of liquid waste from Suger Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT – V
Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Text book:
1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.
References:
1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

IV Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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OPEN ELECTIVE - III

PERT & CM

Pre Requisites:
Course Objectives:
Course Outcomes:

UNIT – I
Project management
Introduction-project planning-project scheduling-project controlling-Project monitoring and control--project monitoring and information cell-Decision-making in project management –project life cycle or project cycle-pre-project execution stage or pre-investment stage-project operation stage or post-investment stage –basic tool and techniques of project management-bar charts ,mile stone charts and velocity diagrams-network techniques-role of network techniques-PERT/CPM

UNIT – II
BAR CHARTS, MILE STONE CHARTS AND VELOCITY DIAGRAMS
Introduction- Bar charts -Steps for the construction of a bar chart-Limitations of bar charts-lack of degree of details-Interdependence between activities-Review of project process-Time uncertainties-Milestones charts-Velocity diagrams-Development of Network--CPM/PRET Networks-Advantages of Network over Milestone chart

UNIT – III
FUNDAMENTALS OF NETWORKS
-Introduction-Activity-Inter –Relationships among Activities-Dummy Activities (or Zero Time Activities)-Redundant predecessor Relationships-Cycles-Events-Guidelines for construction of Network-Work breakdown schedule-Forward and backward planning -Combining Networks-The Activity –on-Node Diagram or AON Diagram

UNIT – IV
-Introduction-Cpm and pert-a comparison-CPM-NETWORKS-Time estimate of an activity-compassion of Float and Time

UNIT – V
-Introduction-Classification of project costs and project times-Project Time-Cost relationship-optimum cost and optimum duration-contracting the network for optimization of project cost and project duration

Text book:-
PERT AND CPM by Dr.P.N.Modi, Sanjeev Modi, RajeevModi, rajsons publications Pvt.Ltd.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem	L	T	P	C
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OPEN ELECTIVE - III
FINITE ELEMENT METHODS (Pre –Requisites, Course Objectives & Outcomes Should be included from FEM in Civil Engineering)

Pre Requisites: SA – I & SA – II

Course Objectives: The subject provides finite element methods and analysis

Course Outcomes: Anslysis Finite Element in engineering

UNIT – I

Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.

UNIT – II
Lagrangian – Serenalipity elements – Hermit polynomials – regular, Irregular 2 D & 3D – Element –shape functions upto quadratic formulation.
Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain

UNIT – III
FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.

UNIT – IV
FEA Two dimessional problem – CST – LST element – shape function – stress – strain.
Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis -formulation of CST element.

UNIT-V
Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:
1.Finite element method by logan daryl
2. Finite element method by chandrupatta, belegunda

REFERENCES:
1. Finite element analysis by p. seshu, TMH
2. Finite element methods by C.S. Krishnamurthy

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech. Civil Engg. II-Sem   **L   T   P   C**
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OPEN ELECTIVE - III

ENVIRONMENTAL IMPACT ASSESSMENT

Pre Requisites: Environmental Engineering

Course Objectives: This subject will cover various aspects of Environment Impact Assessment methodologies, impact of development activities. Impact on surface water, Air and Biological Environment, Environment legislation Environment.

Course Outcomes: Environmental Science

UNIT – I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT-II

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT-III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

UNIT – IV

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocell, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

UNIT - V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for   various Industries.

Text Books:
1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Barthwal, R. R. B. – Environmental Impact Assessment, New Age International Publications

References:
1. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
1. Suresh K. Dhaneja - Environmental Science and Engineering, S.K.,Katania& Sons Publication., New Delhi.
2. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication(P) Ltd, Delhi.
3. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers- Routledge, London, 1992.