

**CURRICULUM OF CIVIL ENGINEERING
RGUKT BASAR**

**III YEAR
I SEMESTER**

Subject Code	Course Name	L-T-P	Credits
CE3101	Hydraulic Engineering	4-1-0	4
CE3102	Transportation Engineering-II	4-0-0	4
CE3103	Structural Analysis-II	4-0-0	4
CE3104	Soil Mechanics	4-0-0	4
CE3105	Design of Steel Structures	4-0-0	4
BM3101	Personality Development	2-0-0	1
CE3701	Hydraulics Engineering Lab	0-0-3	2
CE3702	Soil Mechanics Lab	0-0-3	2
CE3901	Seminar-II		1
Total		22-0-6	26

CE3101

HYDRAULIC ENGINEERING

Externals: 60Marks

L-T-P-C

Internals: 40Marks

4-1-0-4

Objectives:

- To study the concept of the flow trough channels and economical design of channels.
- To know the basic concept of gradually varied flow , hydraulic jump and their applications
- To understand the boundary layer theory , concept of drag , lift of streamlined bodies
- To know different theories on dimensional analysis and model concept
- To understand the basic principles of hydraulic turbines , pumps and their hydraulic design

UNIT –I

Steady uniform flow through open channels: Descriptions and definitions , difference between pipe flow and channel flow , velocity and pressure distributions in a channel cross section, energy and momentum correction coefficients , friction to flow in open channels, uniform flow, chezy's formula, most efficient channel section, specific energy concept and applications of critical depth

UNI T-II

Gradually varied flow: Significance of Froude's number, dynamic equation for gradually varied flow, classification of gradually varied flow profiles, computation for flow profiles,direct step method. Hydraulic Jump: Momentum equation for jump in a horizontal rectangular channel, elementary surge analysis.

UNI T-III

Dimensional analysis and model studies: Dimensional analysis as a tool in experimental hydraulics, Buckingham's theorem, applications, geometric, kinematic and dynamic Similarity laws, significance of Reynolds, Froude and Mach similarity laws, different types of models and their scale ratios.

UNI T-IV

Hydraulic turbines:classification, specific speed, velocity triangles and principles of design of reaction and impulse turbines, characteristic curves.

UNIT- V

Centrifugal pumps and Reciprocating pumps:various components, work done and efficiency, minimum starting speed,Euler head equation, specific speed and characteristics curves of centrifugal pumps.

Suggested Reading:

1. C.S.P.Ojha, R.Berndtsson.P.N.Chandramouli, Fluid Mechanics and Machinery, Oxford University Press, New Delhi, 2010.
2. Hanif Chaudhary, M, Open Channel flow, Prentice-Hall of India Pvt.Ltd., New Delhi, 1993.
3. Subramanya, K, Flow through open channels, Tata McGraw-Hill Publishing Company, New Delhi, 1986.
4. A.K.Jain Fluid Mechanics, Khanna publishers, 1993.

CE3102

TRANSPORTATION ENGINEERING-II

Externals: 60Marks

L-T-P-C

Internals: 40Marks

4-0-0-4

Objectives:

To understand the demand management systems and traffic problems in urban areas

To understand the pavement evaluation techniques and design of overlays

To understand the geometric designing concepts in airport and railway engineering

To understand the capacity analysis of highways

UNIT I

Travel demand management: Traffic management systems (TMS), restrictions on turning movements, one way streets, tidal flow, operations, exclusive bus lanes, traffic relief at junctions, at plane, parking studies, parking inventories, type of parking services, parking analysis, and bottle necks.

Nature of traffic problems in cities: Effect on environment due to traffic noise and air pollution, introduction to computer applications in traffic and transport planning.

UNIT – II

Highway capacity and economic evaluation: Concept of passenger car units (PCU), concepts and factors affecting the levels of service, concept of lane capacities and standards, multilane capacities for rural, urban, and express ways. Cost benefits ratio, net present value, rate of returns and their relative comparison for evaluation. Estimation of accident costs.

UNIT – III

Pavement distress and evaluation: Methods of evaluation, structural evaluation, Functional evaluation, NDT methods, Benkelman beam method, Falling weight deflectometer method, International Roughness Index (IRI), overlays, significance and requirements of highway drainage. Highway maintenance and pavement management systems.

UNIT – IV

Railway Engineering: Introduction to Railways, permanent way component parts and its functions. Rails - various types, functions, creep in rails, creep measurement, coning of wheels and rail fixations. Sleepers - various types. Merits and demerits, ballast, various types and sub grade preparation. Railway alignment and geometric design - alignment.super-elevation, negative super elevation, cant deficiency. example problems. Points and crossing. layout of left and right hand turnouts. Construction and maintenance of permanent way.

UNIT –V

Airport Engineering: Introduction to air transportation, history and international organizations role in development of airports, air craft types and its characteristics. General lay-out of an airport and its component parts. Site selection of an airport as per ICAO, orientation of runway by wind rose diagrams, basic runway length determination, corrections to basic runway length, geometric design, types of airports as per landing & take-off and dimensions.

References:

1. Khanna. S. K. .Arora, M. G. and Jain. S. S. (1994) "Airport Planning and Design" Fifth edition. Nem Chand & Bros, Roorkee, India.
2. Chandra, S and Agarwal, M. M. (2007) "Railway Engineering" Oxford Higher Education, University Press New Delhi.
3. Principles of Traffic Engineering – Garber &Hoel, Cengage Learning.
4. L.R. Kadiyali, *Principles and Practice of Highway Engineering*, Khanna Publications, New Delhi, 2000
5. Haas and Hudson W. R., "Pavement Management Systems" Mcgraw Hill publications 2.004

CE3103

STRUCTURAL ANALYSIS-II

Externals: 60Marks

Internals: 40Marks

L-T-P-C

4-1-0-4

Objectives:

- To understand the analysis of structural elements subjected to moving loads & the analysis of road/railway bridges and gantry girders.
- To explain the concepts involved in the analysis of suspension cable bridges.
- To illustrate the matrix methods of structural analysis for computer applications.
- To brief about the software package **Staad-pro**.

UNIT-I

Moving loads:Influence line for support reaction,bending moment and shear force at any location for simple beams. Determination of maximum bending moment and shear force for moving load system on simply supported girders.

Curves of maximum bending moment and shear force:for simply supported girders traversed by (1) single point load, (2) two point loads, (3) uniformly distributed load longer/shorter than span,enveloping parabola and **EUDLL**.

UNIT-II

Moving loads on trusses/girders: Influence line for forces in members of statically determinate plane framed structures under moving loads for Warren girder, Pratt truss, and Curved flange truss.

Suspension Bridges: Stresses in suspended loaded cables, length of cable, simple suspension bridge with 3-hinged stiffening girders for static load,Influence lines for horizontal and vertical components of tension in the cable,tension in the cable,bending moment and shear force.

UNIT-III

Flexibility Matrix Method: Determination of static and kinematic indeterminacy – Equilibrium and compatibility conditions-Principles of superposition,Application of Flexibility Matrix Method to continuous beams,plane-trusses, plane-forms and Ortho grid structures (Static indeterminacy not exceeding three)-Effect of temperature, Lack of fit and Pre-stressing forces

UNIT-IV

Stiffness Matrix Method:Application of Stiffness Matrix Method to continuous beams,plane trusses, plane frames and Ortho grid structures (Degree of freedom not exceeding three) Construction of stiffness Matrix for frames-Direct Method.

UNIT-V

Direct Element Method:Development of Stiffness matrices for bars, truss and beam elements. Application of direct element method to problems of axially loaded bars, continuous beams, plane trusses and plane frames to obtain joint displacements and member end forces. Developing shear force and bending moment diagrams. Instruction to software package **STAAD Pro**

Suggested Reading:

1. S. B. Junarkar and Shah, Mechanics of structures, Charotar Pub, House, 2001
2. D. S. Prakash Rao, Structural Analysis -a Unified Approach, University Press, 1991
3. B. C. Punmia and A. K. Jain, Theory of structures, Vol.1, Tata McGraw Hill, New Delhi, 1999.
4. J. M. Gere & William Weaver, Matrix Analysis of Framed Structures, 2nd Ed., D Van Nostand, New Jersey, 1980.

CE3104

SOIL MECHANICS

Externals: 60Marks

L-T-P-C

Internals: 40Marks

4-0-0-4

Objectives:

- To enable characterization of soils based on index and engineering properties.
- To understand soil-water interaction.
- To explain strength and compressibility characteristics of soils.
- To describe the machines involved in earth pressure and slope stability analysis.
- To equip the students for application of principles of soil mechanics in foundation engineering.

Unit - I

Origin and Characteristics of soil: Introduction, Engineering geology and formation of soil, Weight ratios (Water content, Density, Unit weights, Specific Gravity); Volume ratios (void ratio, porosity, degree of saturation, relative density); Interrelationships, Laboratory tests for determination of Index properties, Atterberg limits. Classification and Identification of soils for general and engineering purposes as per IS: 1498-1970, Soil structure and Clay minerals.

Unit - II

Permeability: Bernoulli's equation, Darcy's law for flow through soils, hydraulic conductivity, Factors affecting permeability, Laboratory tests for determination of coefficient of permeability (constant head, variable head permeability tests), Field tests (pumping in and pumping out tests), Equivalent permeability of stratified soils.

Seepage through soils: Seepage, Flow nets, Locating phreatic line in a homogeneous earthen dam, Seepage calculations for geotechnical structures (Masonry dams, concrete dams, earth dams), Uplift pressure.

Stress analysis: In-Situ Stresses, Effective stresses, Pore water pressure, Capillary rise, piping, quicksand condition – critical hydraulic gradient.

Unit - III

Compaction of soil: Compaction Mechanism; factors affecting compaction. Laboratory determination of compaction characteristics – standard and modified proctor tests – IS Light and Heavy compaction tests; Field surface compaction: compaction equipment, procedure, quality control.

Consolidation of soil: Settlement of Soil, Immediate settlement, Over-consolidation, Pre-consolidation pressure, C_c and C_s , Terzaghi's theory of one dimensional consolidation – assumptions and derivation, Determination of coefficient of consolidation, Calculation of settlements using C_c , m_v and rate of settlement (C_v, T_v, U)

Unit - IV

Shear Strength of Soils:Stresses on soil elements, Mohr's Circle, Principal Stresses, Pole, Stress Path, Direct shear test, Mohr-Coulomb Failure criterion, Tri-axial tests- drained and undrained tests, Vane shear test, stress-strain relationships and strength of loose and dense sands, NC and OC clays, dilation, pore pressures, Skempton's coefficients, Shear Strength of unsaturated soil, Liquefaction phenomenon.

Unit - V

Stability of slopes:Definition and classification of slopes, types of slope failure, Factor of safety with respect to cohesion, Analysis of slope stability for finite and infinite slopes - limit equilibrium method, Swedish slip circle method, Taylor's stability number, method of slices and simplified Bishop method.

Suggested Readings:

1. *Principals of Geotechnical Engineering, By: Braja M. Das., Fifth edition, First reprint 2002, low price edition, Thomson learning Inc.*
2. *Basic & Applied Soil Mechanics, By: GopalRanjan / Rao A.S.R. 2003 print, New Age International Pvt Ltd.*
3. *Lame, T.W. And Whitman, R.V, "Soil Mechanics", Jhon Wiley &Sones Inc., NY,1969.*
4. *Murthy, V.N.S., " Soil Mechanics & Foundation Engineering".DhanpatRai&Sons' 2006.*
5. *Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard publishers Distributors, revised and enlarged sixth edition,2007.*
6. *Relevant IS Codes.*

CE3105

DESIGN OF STEEL STRUCTURES

Externals: 60Marks

Internals: 40Marks

L-T-P-C

4-0-0-4

Objectives:

- To know the IS codal provisions as applicable for the designs.
- To understand the material behavior and basics of design of steel structures.
- To learn the design of various members along with the connections.
- To explain the design principles of roof trusses.

Unit – I

Materials and specifications: Chemical composition of steel, types of structures steel, Residual stresses, stress Concentration.

Basis of Structural Design: Codes and specifications, Design Philosophies, Working stress method, Limit state method.

Loading and load Combinations: Characteristic loads, Dead loads, Imposed loads, Earthquake loads, and Wind loads and load Combinations. Partial safety factors for materials and loads.

Bolted Connections (Limit state method): Bolted Connections, Behavior of bolted joints Design Strength of ordinary Black bolts, Design strength of high strength friction grip bolts, pin connections and Eccentric connections.

Welded Connections (Limit state method): Advantages of Welding, types of welds and joints simple connections and Eccentric connections.

Unit – II

Design of Tension Members (Limit state method): Types of tension members ,design of strands ,slenderness ratio, modes of failure ,factors effecting strength of tension members, design of tension members(angles, other sections and rods),lug angles, tension member splice.

Unit - III

Design of Compression members (Limit state method): introduction, possible failure modes. behavior of compression members ,elastic buckling of slender compression members, .behavior of compression members, sections of compression members, effective length design of compression members with single section and built-up sections (symmetric in both directions),lacing and battening column splices.

Design of column bases (Limit state method): design of slab base and gusseted base for columns.

Unit - IV

Design of beams (Limit state method): Types of beams, section classification ,lateral stability of beams, buckling of real beams ,behavior of beams in bending ,design of laterally supported and unsupported beams ,design of compound beams ,shear strength of beams ,maximum deflection ,wed buckling crippling ,biaxial bending and unsymmetrical bending.

Unit - V

Design of Roof trusses (Limit state method): Types of trusses, end bearings, spacing of trusses and purlins, estimation of loads with different roof coverings, self -weight of truss, wind effects, design of purlins for dead load and wind loads. Detailed design of roof trusses including joints and supports (only angular trusses).

Suggested Reading:

1. *Subramanian. N, design of steel structures, Oxford University Press, 2008.*
2. *Shiyekar M.R., Limit State Design in Stuctural Steel, PHI Learning Pvt.Ltd. 2010.*
3. *Bhavikatti, SS. ,: Design of Steel Structures:, I.K International Publishing House Pvt.Ltd 2010*
4. *Duggal S.K., Design of Steel Structures, Tata McGraw Hill Publishing, 2009.*

BM3101

PERSONALITY DEVELOPMENT

Externals: 60Marks

L-T-P-C

Internals: 40Marks

2-0-0-1

Guidelines: Learning approach is based on Real time case studies with class room activities

Course Objectives:

1. To develop interpersonal skills and be an effective goal oriented team player.
2. To develop professionals with idealistic, practical and moral values.
3. To develop communication and problem solving skills.
4. To re-engineer attitude and understand its influence on behavior.
5. To enhance holistic development of students and improve their employability skills.

UNIT I-SELF ANALYSIS (6 hours)

SWOT Analysis, Who am I, Personality Traits, Importance of Self Confidence, Self Esteem.

UNIT II-GOALS SETTINGS (6 hours)

Short term, Long term goal settings, SMART concept
Diversifying Risk and Optimizing Opportunities

UNIT III- TEAM DYNAMICS WITH INTERPERSONAL SKILLS (8 hours)

Team Dynamics, Team Work, Interpersonal Skills

Behavioral Skills GD, PI, Body Language Public Speaking, Verbal, Non Verbal Communications

UNIT IV-CREATIVITY AND RATIONALITY (8 hours)

Out of Box thinking, Idea Generation with creativity Brain Storming, Effective group meetings, Rationalization of ideas and way to effective implementation.

Class room and team activities coupled with group tasks depending upon time availability

CE3701

HYDRAULICS ENGINEERING LAB

Externals: 60Marks

Internals: 40Marks

L-T-P-C

0-0-3-2

List of experiments:

1. Measurement of coefficient of discharge through notches (V notch and Rectangular notch).
2. To investigate the reaction forces produced by the change in momentum of a fluid flow.
3. To demonstrate ground water flow and the resulting hydraulic gradient between two different potentials.
4. To determine the Cone of Depression for a single/double well in an unconfined aquifer.
5. To obtain the characteristic curves for an Impulse turbine operating at a range of fluid flow rates.
6. To obtain the characteristic curves for Reaction turbine operating at a range of fluid flow rates.
7. To obtain the characteristic curves for Francis turbine operating at a range of fluid flow rates.
8. To determine Rainfall-runoff relationships (storm hydrographs), Generation of Overland Flow, sediment yield using Advanced Environmental Hydrology System

CE3702

SOIL MECHANICS LAB

Externals: 60Marks

Internals: 40Marks

L-T-P-C

0-0-3-2

List of experiments:

1. Determination of moisture content (water content) of soil.
2. Determination of the specific gravity of soil particles finer than 2 mm.
3. Grain size analysis – Mechanical Method
4. Grain size analysis – Hydrometer analysis
5. Atterberg limits determination – Liquid Limit, Plastic Limit, Shrinkage Limit
6. Determination of the in-situ density of soils by core cutter method or sand replacement method.
7. Determination of the max. dry density – optimum moisture content for a soil from Proctor test.
8. Determination of the Coefficient of permeability of the soil – Falling head method.
9. Determination of one-dimensional consolidation parameters of an undisturbed cohesive soil sample from consolidation test.
10. Determination of shear strength parameters of a silty or sandy soil at known density and moisture content by direct sheat test.

Determination of shear strength parameters of the fine grained soil by Triaxial tests – UC, UU, CU, CD tests.

CE3901**SEMINAR-II****Externals: 25 Marks****L-T-P-C****0-0-2-1****Objectives:**

Objective of the project seminar is to actively involve the students in preparation of the final year project with regard to following components:

- Problem definition and specification
- Literature survey, familiarity with research journals
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of graphs, bar (activity) charts and analyzing the results.
- Presentation - oral and written.

The evaluation is purely internal and will be conducted as follows:

Preliminary Report on progress of the work and viva	05 marks
Final report	05 marks
Presentation and Defense before a departmental committee consisting of Head, a senior faculty and supervisor	15 marks
