BACHELOR OF TECHNOLOGY

Civil Engineering Department

Semester - V

Course Scheme

Course Code	Course Name	Lecture hours	Tutorial hours	Practical hours	Credit
HS 213001	Introduction to Economics	3	0	0	3
CE 203001	Transportation Engineering-2	3	1	0	4
CE 203002	Geotechnical Engineering-1	3	1	0	4
CE 203102	Geotechnical Engineering-1 - Lab	0	0	2	1
CE 203003	Hydrology and Hydraulic Structures	3	2	0	5
CE 203004	Structural Analysis	3	2	0	5
	Total	**15**	**6**	**2**	**22**

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<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">HS 213001</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Introduction to Economics</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>IV</td><td>Prerequisites (if any)</td><td colspan="4">Nil</td></tr>
<tr><td>V</td><td>Course Coordinator</td><td colspan="4"></td></tr>
<tr><td>VI</td><td>Course Contents</td><td colspan="4">

Introduction to Economics
Introduction to Economics and definition of economics, Branches of Economics, Meaning of Managerial Economics, Nature, and Scope & Objective of Managerial Economics.
Demand and Supply Analysis
The demand & Supply Schedule, Demand function and Supply function, Law of Demand & Supply , Determinants of Demand & Supply, Demand and supply curve shift, Equilibrium with supply and demand curve. Effects of a shift in Supply or Demand, Interpreting Changes in Price & Quantity, Types of Elasticity of Demand & Supply, Measurement of Elasticity.
Theory of Production & Cost
Basic Concept of production, The Production function, Factors of Production, Total, Average & Marginal product, Short & Long Run production Function, Law of Variable proportion, Law of Return to Scale, Law of diminishing Marginal product, Concept of cost, Total ,Marginal & Average Cost, Short Run & Long Run Cost, Relation Ship Between Marginal & Average cost.
Market Structures
Market Structure –I Perfect Competition, Price & output Determination under perfect Competitive Market, Short Run & Long Run Equilibrium, Market Structure-II Monopoly, Definition of Imperfect Competition, Basic Concept of Monopoly, Short & Long run equilibrium Under Monopoly. Market Structure III Monopolistic Competition, Concept of Monopolistic Competition, Features of Monopolistic Competition, Market Structure –IV Oligopoly, Concept of Oligopoly Market, Features of Oligopoly.
Measuring National Output and National Income

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		Structure of Macro Economy, Different sectors of the economy, Circular Flow of Income & Product, Leakages & Injections in the Circular Flow, Concepts relating to National Income and related Aggregates, Methods of calculation of National Income, GDP deflator, CPI and WPI and its impact on business. • **Unemployment and Inflation** Types and causes of unemployment, Measures to solve unemployment problem, Inflation, Meaning and types, Explanation of Inflation- demand pull inflation & cost push inflation, Effects of Inflation on distribution of income & wealth and on output & growth, Methods to control Inflation. • **The Balance of Payments and Exchange Rates** Balance of Payments, Meaning and Components, Difference between BOP & BOT, Causes of disequilibrium in BOP, Measures to correct disequilibrium in BOP, Exchange Rate Determination, Meaning of Foreign Exchange Rate, Types of Exchange Rate- Fixed & Flexible Exchange Rate System, Purchasing Power Parity Theory. • **Time Value of Money and Economic Equivalence** Cost- benefit analysis , Project Cash Flows, Initial Project Screening Methods: payback Screening and Discounted Cash Flow Analysis, Variations of Present-Worth Analysis.
VI	Text/References	1. Paul A Samuelson and William D Nordhaus (2013), Economics. McGraw Hill 2. Macroeconomics: Dornbusch, Fischer, and Startz (Ninth Edition), 2004. Tata McGraw-Hill 3. Macroeconomics: Olivier Blanchard (Fourth Edition), 2007. Pearson Education 4. Romer D., 1996, Advanced Macroeconomics, McGraw-Hill International 5. William A. McEachern and Simrit Kaur, Micro ECON: A South-Asian Perspective, Cengage Learning 6. Vanita Agarwal, Managerial Economics, Pearson 7. Managerial Economics — Peterson and Lewis — Pearson 8. Managerial Economics — H L Ahuja — Sultan Chand 9. Managerial Economics — P L Mehta — Sultan Chand 10. Economics for Managers — Hirschey — Thomson 11. Managerial Economics — Atmanand — Excel Books

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I	Course Code	**CE 203001**			
II	Course Title	**Transportation Engineering-2**			
III	Credit Structure	**L**	**T**	**P**	**C**
		3	1	0	4
	Prerequisite(If any for the student)	Transportation Engineering-1			
V	Course Content	• **Transportation Planning**: Planning Objectives; Planning Process; Transportation surveys; Four stage Travel Demand Modelling: Trip Generation- Factors affecting productions and attractions, Prediction techniques – Regression analysis and Category analysis; Trip Distribution – Predictions Techniques – Growth Factor methods and Synthetic models; Modal Split Analysis – Factors affecting mode choice, Models – Trip End and Trip Interchange, Logit Models; and Route Assignment Analysis – Factors affecting route choice, Shortest path method, Trip Assignment Techniques – All or Nothing and CRT model. • **Urban Mass Transit Systems:** Introduction to various types of mass transportation systems, Mass transit system characteristics, Terminals and their functions. • **Airport Engineering:** Air transport- structure and organization, the challenges and the issues, Airport master plan, Aircraft characteristics, Geometric design of airfields, Air Traffic Control. • **Railway Engineering:** Rail transportation importance, Current scenario of Indian Railways System, Railway track gauges, Elements of Geometric design, Points and Crossings, Railway accidents and Disaster Management.			
VI	Text/References	1. Transportation Engineering and Planning: C.S. Papacostas and P.D. Prevedouros; Prentice Hall India Learning Pvt. Ltd., New Delhi 2. Transportation Engineering: Khisty, C.J.and Lall, Kent, B.;Prentice Hall India Learning Pvt. Ltd., New Delhi. 3. Modelling Transport (4 Edition), Juan de Dios Ortuzar and Luis G. Willumsen (2011, Wiley). 4. Urban Public Transportation –Systems and Technology, Vukan R. Vuchic (2007 Wiley). 5. Transportation Engineering: An Introduction (3rd Edition), C. JotinKhisty and B. Kent Lall 6. Horonjeff , R. Mickelvey, F.X, Planning & design of airports, Mc Graw Hill, New York, 4th edition. 7. Khanna, S.K., Arora, M.G., and S.S. Jain; Airport Planning and Design, Nem Chand & Brothers. 8. Saxena S.C. and Arora S.P., Railway Engineering Dhanpat rai Hay, W.W Railway Engineering John Wiley and Sons, New York.			
VI	Any other Remarks:				

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<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">CE 203002</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Geotechnical Engineering-1</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4"></td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">

Basic Concepts and Classification of Soil: Scope of Soil Mechanics; Origin and formation of soil; Terminology of different types of soils; Soil as three phase system; weight-volume relationships; Particle size analysis and Plasticity characteristics of soil; Clay mineralogy; Sensitivity and thixotropy; Classifications of soils
Compaction: Principle of soil compaction; laboratory compaction; Fac- tors affecting soil compaction; Field compaction
Permeability and Seepage: Permeability of soils; Seepage and flow nets; Effective stress principle; Introduction to liquefaction
Consolidation: Compressibility and consolidation; spring analogy; pre- consolidation pressure; Terzaghi’s theory of one dimensional consolidation;time-settlement curve; computation of settlement
Stresses in soil: Computation of stresses in soil using Boussinesq theory, Westergaard theory and Newmark’s chart; arching in soils
Shear Strength of Soil: Principle stresses in soil; Graphical method of determination of stresses; Shear strength of soils; Mohr-coulomb failure criteria; Total stress and effective stress analysis; Shear strength testing; Introduction to stress paths

</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">

Soil Mechanics in Engineering Practice by Karl Terzaghi (Wiley India)
Textbook of Geotechnical Engineering by B. M. Das (Cengage Learning)
Basic and Applied Soil Mechanics by G. Ranjan and A. S. R. Rao (New Age International)
Geotechnical Engineering: principles and Practices by D. P. Koduto (Prentice Hall of India Pvt. Ltd.)
Geotechnical Engineering: A Practical Problem Solving Approach by N. Sivakugan and B. M. Das (Cengage Learning)
Recent relevant literature

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<tr><td>I</td><td>Course Code</td><td colspan="4">CE 203102</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Geotechnical Engineering-1 -Lab</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4"></td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Laboratory experiments:
1. Preparation of soil and determination of moisture content by ovendrying method and rapid moisture meter
2. Determination of specific gravity of soil by density bottle / Pycnometer
3. Visual classification of soil, particle size distribution by sieve analysis
4. Particle size distribution by sedimentation analysis (hydrometermethod)
5. Determination of dry density of soil by core cutter method
6. Determination of dry density of soil by sand replacement method
7. Determination of Atterberg’s limits, i.e. liquid limit, plastic limit andshrinkage limit of soil
8. Indian standard light compaction test (Standard Proctor Test)
9. Indian standard heavy compaction test (Modified Proctor Test)
10. Determination of relative density
11. Determination of hydraulic conductivity by constant head permeabilitytest
12. Determination of hydraulic conductivity by falling head permeabilitytest</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">1. Manual of Soil Laboratory Testing (Volume 1 and Volume 2) by K. H.Head
2. Soil Mechanics Laboratory Testing by B. M. Das
3. Soil Mechanics Lab Manual, 2nd Edition by Michael E. Kalinski
4. Relevant Indian Standard Codes (IS 2720 Series).</td></tr>
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<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">CE 203003</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Hydrology and Hydraulic Structures</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>2</td><td>0</td><td>5</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Fluid Mechanics</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Part-I Hydrology:
• Introduction: Definition; Hydrologic cycle; Water Budget Equation; Appli- cations in engineering.
• Precipitation: Types of precipitation; Measurement of precipitation; Rain- gauge network and number of raingauges; Estimation of missing data; Data consistency; Mean rainfall and method of determination; Frequency of point rainfall.
• Stream flow measurements: Measurement of stage and velocity; Stream flow measurement methods, Stage-discharge relationship, Extrapolation of rating curve.
• Hydrographs: Definition, type and components of Hydrographs; Factors affecting Hydrographs; Methods of base-flow separation; Effective rainfall; Unit hydrograph and its derivations for different durations; S-curve.
• Flood and Flood Routing: Floods – Introduction; rational method and time of concentration; Runoff coefficient and its calculation; Flood frequency analysis – Gumbel’s method and log Pearson type-III method; Design flood and risk analysis. Flood routing- basic equation of routing; Hydrologic and Hydraulic methods of flood routing.

Part-II Hydraulic Structures:
• Reservoirs and planning for dam reservoirs: Types of Reservoirs, Capacity-Elevation and Area- Elevation curves, Storage zones of Reservoir, Designing capacity of reservoir, Reservoir Sedimentation, Losses and Clear- ance.
• Design and construction of Gravity Dams: Forces acting on Gravity dam, Modes of failure and Structural stability of Gravity dams, Stability analysis of gravity dams, Construction of gravity dams.
• Spillways, Energy dissipator and Spillway gates: Location of spillway, Design consideration for the main spillway, Straight drop spillway, Ogee spill- way, Trough spillway, side channel spillway, shaft spillway, Syphon spillway, Energy dissipation below various types of spillways, Hydraulic jump, its use as energy disspator and design of stilling basins.
• River training works: Introduction and various types of structures adopted for river training works.</td></tr>
</table>

VI	Text/References	**Textbooks:** 1. Engineering Hydrology, K Subramanya, Tata McGraw Hill. 2. Applied Hydrology, VenTe Chow, McGraw Hill. 3. Irrigation Engineering and Hydraulic Structures, Santosh Kumar Garg,Khanna Publishers. 4. Hydraulic Structures, P. Novak, A.I.B. Moffat, C. Nalluri, R.Narayanan, Taylor and Francis. 5. River Behavior Management and Training, Vol. I and Vol. II, CentralBoard of Irrigation and Power (CBIP)
VII	Any other Remarks:	

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<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">CE 203004</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Structural Analysis</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>2</td><td>0</td><td>5</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4"></td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Analysis of determinate structures
• Review of beam deflection theory, Energy methods of deformation: Strain energy, energy relations in structural theory, Virtual work, Reciprocal theorem, Castigliano’s theorem,
• Three hinged arches: Types of arches, static analysis of arch, symmetric and non-symmetric arches, effect of support at different elevations, Bending moment diagram
• Deflection analysis of plane trusses: Force analysis, geometric stability and static determinacy of trusses, analysis of trusses
Analysis of indeterminate structures
• Static and kinematic indeterminacy, Method of consistent deformation for fixed beams,
• Theorem of Three Moments: Derivation and application of three moment equations
• Slope Deflection Method: Introduction, sign convention, derivation of slope deflection equations, analysis of continuous beams, analysis of frames with and without lateral deflection.
• Moment Distribution Method: Introduction, development of method, carry-over factor, distribution factor, analysis of continuous beams, analysis of frames with and without sway
• Two Hinged Arches: Derivation and application of two hinged arches
Cables and suspension bridges
General cable theorem, Cables under a given system of loading, Anchor cables, Temperature stresses, Stiffening girders
Rolling loads and influence lines
Maximum shear force and bending moments at sections under a given system of loading, Influence lines for simple beam reactions, Influence line for shear and moments, Influence lines for truss reactions and member forces</td></tr>
</table>

VI	Text/References	1. Reddy, C. S., 'Basic structural Analysis', Tata Mcgraw Hill. 2. Hibbeler, R. C., 'Structural Analysis', Pearson Publictions. 3. Menon, D., 'Structural Analysis', Narosa Publications. 4. Punmia, B. C., Jain, A., and Jain, A., 'Theory of structures', LaxmiPublications Pvt. Ltd. 5. Pandit, G. S., Gupta, S. P., and Gupta, R., 'Theory of structures - I andII', Tata Mcgraw Hill.