

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
*(Formerly West Bengal University of Technology)*  
**Syllabus for B. Tech in Civil & Environmental Engineering**  
(Applicable from the academic session 2018-2019)

**SEMESTER V**  
**THEORY**

**ECONOMICS FOR ENGINEERS**

**CODE: HU 501**

**CONTRACTS: 1L**

**CREDITS: 1**

**Module-I**

1. Economic Decisions Making – Overview, Problems, Role, Decision making process.
2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.

**Module-II**

3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.
4. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.

**Module-III**

5. Inflation And Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.
6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.
7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.

**Module-IV**

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8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.
9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.
10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.

***Readings***

1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House, (AICTE Recommended – 2018).
3. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
4. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
5. Sullivan and Wicks: Engineering Economy, Pearson
6. R. Paneer Seelvan: Engineering Economics, PHI
7. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

**UNIT OPERATIONS OF CHEMICAL ENGINEERING – II**

**CODE: CHE514**

**CONTRACTS: 2L + 1T**

**CREDITS: 2**

**Module I: 10L**

Introduction to mass transfer: Molecular diffusion in fluids, diffusivity, mass transfer coefficients, interphase mass transfer, gas absorption, countercurrent multistage operation, packed tower.

**Module II: 10L**

Distillation: Vapor-liquid equilibrium, Rayleigh's equation, flash and differential distillation, continuous rectification, McCabe-Thiele method, bubble cap and sieve distillation column.

**Module III: 10L**

Extraction, Drying and Crystallization: Liquid-liquid equilibrium, liquid extraction, stage-wise contact, liquid-solid equilibria, leaching, batch drying and mechanism of batch drying, principle and operation of a spray drier, preliminary idea of crystallization.

**Module IV: 10L**

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Advanced separation processes: Dialysis, ultrafiltration, reverse osmosis, pervaporation, electro dialysis and membrane separation.

**Revision: 5L**

Books:

1. Unit Operations of Chemical Engineering; McCabe, Smith & Harriot; 6th ed, TMH.
2. Transport Processes & Unit operations; Geankopolis; 3rd ed, PHI.
3. Chemical Engineering, Vol-I & II, Colson & Richardson; Butterworth Heinemann.
4. Chemical Engineer's Handbook; Perry, Chilton & Green; MGH.

**The hours allotted are lecture hours, the tutorial classes should be held accordingly to contact hours allotted subject wise**

**DESIGN OF RC STRUCTURES-A**  
**CODE: CE502A**  
**CONTACT: 2L + 1T**  
**CREDITS: 2**

Introduction: Principles of design of reinforced concrete members - Working stress and Limit State method of design 2L

Working stress method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces - Balanced, under reinforced and overreinforced beam/ slab sections; design of singly and doubly reinforced sections 5L

Limit state method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces; concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP:16). 5L

Analysis, design and detailing of singly reinforced rectangular, 'T', 'L' and doubly reinforced beam sections by limit state method. 5L

**Text & References**

- 1 IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice" Bureau of Indian Standard
- 2 SP:16 Design Aid to IS 456
- 3 Reinforced Concrete Design by Pillai and Menon TMH
- 4 Reinforced concrete Limit state design Ashok K. Jain
- 5 Reinforced concrete S.N.Sinha TMH
- 6 Fundamentals of reinforced concrete N.C.Sinha and S.K. Roy S.Chand &Co
7. Limit State Design of Reinforced Concrete P. C. Varghese PHI
8. Reinforced Concrete S. K. Mallick and A. P.GuptaOxford IBH

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**DESIGN OF RC STRUCTURES-B**

**CODE: CE502B**

**CONTACT: 2L + 1T**

**CREDITS: 2**

Design and detailing of one-way and two-way slab panels as per IS code provisions	6L
Design and detailing of continuous beams and slabs as per IS code provisions	3L
Staircases: Types; Design and detailing of reinforced concrete doglegged staircase	3L
Design and detailing of reinforced concrete short columns of rectangular and circular cross sections under axial load. Design of short columns subjected to axial load with moments (uniaxial and biaxial bending) – using SP 16.	3L
Shallow foundations: Types; Design and detailing of reinforced concrete isolated Square and Rectangular footing for columns as per IS code provisions by limit state method	4L

**Text & References**

- 1 IS: 456- 2000 “Indian Standard for Plain and reinforced concrete – code of practice” Bureau of Indian Standard
- 2 SP:16 Design Aid to IS 456
- 3 Reinforced Concrete Design by Pillai and Menon TMH
- 4 Reinforced concrete Limit state design Ashok K. Jain
- 5 Reinforced concrete S.N.Sinha TMH
- 6 Fundamentals of reinforced concrete N.C.Sinha and S.K. Roy S.Chand &Co
7. Limit State Design of Reinforced Concrete P. C. Varghese PHI
8. Reinforced Concrete S. K. Mallick and A. P.GuptaOxford IBH

**CONCRETE TECHNOLOGY-A**

**CODE: CE503A**

**CONTACT: 2L**

**CREDITS: 2**

Concrete as a Structural Material, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration and Strength, Tests on Cement and Cement Paste – fineness, consistency, setting time, soundness, strength Quality of Water – Mixing Water, Curing Water, Harmful Contents  
6L

Types of Portland Cement – ordinary, Rapid hardening, low-heat, sulphate resisting, Portland slag, Portland pozzolana, super sulphated cement, white cement  
4L

Aggregates – Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-

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Aggregate Reaction, Sieve Analysis, Grading Curves, Fineness modules, Grading Requirements. Testing of Aggregates – Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value 8L

**Text & References**

- 1 Concrete Technology Neville Pearson Education
- 2 Concrete Technology M.S. Shetty S.Chand
- 3 Concrete Technology A. R. Santakumar OXFORD University Press
- 4 Concrete Technology M.L. Gambhir Tata McGraw Hill
- 5 Text book of Concrete Technology P.D. Kulkarni Tata McGraw Hill

**CONCRETE TECHNOLOGY-B**

**CODE: CE503B**

**CONTACT: 2L**

**CREDITS: 2**

Properties of Fresh Concrete – Workability, Factors Affecting Workability, Slump Test Compacting Factor Test, Flow Table Test, Segregation, Bleeding, Setting Time, Mixing and Vibration of Concrete, Mixers and Vibrators, Curing methods, Maturity. 6L

Strength of Concrete – Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress Strain Relation and Modulus of Elasticity, Poisson's Ratio, Shrinkage and Creep, Compression Test on Cubes, Cylinders, Introduction to Non-Destructive Tests (Rebound hammer & Ultrasonic pulse velocity) 6L

Admixtures – different types, effects, uses, Retarders and Super plasticizers. Mix Design by I.S. 20262 (2009). Light-weight, Polymer and Fibre-reinforced concrete 6L

**Text & References**

- 1 Concrete Technology Neville Pearson Education
- 2 Concrete Technology M.S. Shetty S.Chand
- 3 Concrete Technology A. R. Santakumar OXFORD University Press
- 4 Concrete Technology M.L. Gambhir Tata McGraw Hill
- 5 Text book of Concrete Technology P.D. Kulkarni Tata McGraw Hill

**ENGINEERING GEOLOGY-A**

**CODE: CE 504A**

**CONTRACTS: 2L**

**CREDITS: 2**

1. Geology and its importance in Civil Engineering. 2L

2. Mineralogy: Definition, internal and external structure of minerals, study of crystals, Classification and physical properties of minerals. 3L

3. Classification of rocks:

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Igneous rocks: Origin, mode of occurrence, forms & texture, classification and engineering importance. Sedimentary rocks: Process of sedimentation, classification and engineering importance. Metamorphic rocks: Agents and types of metamorphism, classification and engineering importance. 4L

4. Weathering of rocks: Agents and kinds of weathering, soil formation & classification based on origin. 2L

5. Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing. 3L

6. Geophysical exploration: Methods of Geophysical Exploration, electrical resistivity method field procedure – sounding and profiling, electrode configuration, and interpretation of resistivity data. Geophysical surveys in ground water and other Civil Engg. Projects. 4L

**ENGINEERING GEOLOGY-B**

**CODE: CE 504B**

**CONTRACTS: 2L**

**CREDITS: 2**

1. Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition. 1L

2. Structural geology: Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints, importance of geological structures in Civil Engineering. 4L

3. Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercalli's intensity scale and Richter's scale of magnitude. 3L

4. Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strength and abrasive resistance. 3L

5. Rain water harvesting: Designing, types, different usage, determination of economical value 3L

6. Applied Geology: Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations. 4L

7. Landslides: Types of landslides, causes, effects and prevention of landslides. 3L

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**Text & References**

- 1 Engineering and General Geology Parvin Singh Katson publishing house Delhi 1987
- 2 Engineering Geology for Civil Engineers D. Venkat Reddy, Oxford, IBH, 1995.
- 3 Principles of petrology Tyrell Asia, Bombay
- 4 Structural Geology Marland P. Billings Wiley eastern Prentice-Hall, U.S.A.
- 5 Ground Water hydrology Todd D.K. John Wiley & Sons, Second edition, 1980.

**Practical**

**SOIL MECHANICS LAB.-II**

**CODE: CE591**

**CONTACT: 3P**

**CREDIT: 2**

1. Determination of compressibility characteristics of soil by Oedometer test ( co-efficient of consolidation & compression Index)
  2. Determination of unconfined compressive strength of soil
  3. Determination of Shear parameter of soil by Direct shear test
  4. Determination of undrained shear strength of soil by Vane shear test.
  5. Determination of shear parameter of soil by Triaxial test (UU)
  6. Standard Penetration Test
- Expt No. 6 by large groups in the field.

**References**

1. Soil testing by T.W. Lamb ( John Willey)
2. SP-36 (Part-I & Part –II )
3. Soil Mechanics Laboratory Manual by B. M. Das, OXFORD UNIVERSITY PRESS
4. Measurement of engineering properties of soil by E.Jaibaba Reddy & K. Ramasastrri.

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**CONCRETE LABORATORY**

**CODE: CE 592**

**CONTACT: 3P**

**CREDITS: 2**

1. Tests on cement – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength on cement mortar cubes
2. Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modulus, moisture content, bulk density and deleterious materials.
3. Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
4. Tests on Fresh Concrete: Workability: Slump, Vee-Bee, Compaction factor tests
5. Hardened Concrete: Compressive strength on Cubes, Split tensile strength, Static modulus of elasticity, Flexure tests , Non destructive testing (Rebound hammer & Ultrasonic pulse velocity)
6. Mix Design of Concrete.

**References:**

1. Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009), SP23]
2. Laboratory manual of concrete testing by V.V. Sastry and M. L. Gambhir

**QUANTITY SURVEYING, SPECIFICATION AND VALUATION**

**CODE: CE 593**

**CONTACT: 3P**

**CREDITS: 2**

Quantity Surveying: Types of estimates, approximate estimates, items of work, unit of measurement, unit rate of payment.

Quantity estimate of a single storied building

Bar bending schedule.

Details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities.

Estimate of quantities of road, Underground reservoir, Surface drain, Septic tank.

Analysis and schedule of rates: Earthwork, brick flat soling, DPC, PCC and RCC, brick work, plastering, flooring and finishing,

Specification of materials: Brick, cement, fine and coarse aggregates

Specification of works: Plain cement concrete, reinforced cement concrete, first class brickwork, cement plastering, pointing, white washing, colour washing, distempering, lime punning, painting and varnishing

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Valuation: Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalized value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table .

**References:**

1. Estimating, costing, Specification and Valuation in Civil Engineering by M..Chakroborty
2. Estimating and Costing in Civil Engineering” by B.N.Dutta, USB Publishers & Distributers
3. Civil Estimating, Costing and Valuation by Agarwal / Upadhay

**ENGINEERING GEOLOGY LAB**

**CODE: CE 594**

**CONTACT: 3P**

**CREDITS: 2**

**Serial No Experiment on**

1. Study of crystals with the help of crystal models
2. Identification of Rocks and Minerals [Hand Specimens]
3. Microscopic study of Rocks and minerals
4. Study of Geological maps, interpretation of geological structures Thickness problems, Bore-hole Problems