GOVERNMENT OF RAJASTHAN

BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR

SEMESTER SCHEME-2020-21

V SEMESTER

(SESSION 2021-2022 & ONWARDS)

DESIGN OF STEEL AND RCC STRUCTURES

Course Code	CE 5001 (Same as CC 5001)
Course Title	Design of Steel and RCC Structures
Number of Credits	4 (L: 4, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn the concept of limit state design for tension and compression steel members.
- To learn the concept of limit state design of steel beams.
- To understand design of RCC elements.
- To know the design of short and long RCC columns.

COURSE OUTCOMES

After completing this course, student will be able to perform:

- Design of steel tension and compression member.
- Design of steel I and Channel sections.
- Design of singly and doubly reinforced RCC beam.
- Design of RCC beam for shear and development length.
- Design of short and long RCC columns.

COURSE CONTENT

1. Design of Steel Tension and Compression Members (Limit State Method)

1.1 Types of sections used for Tension members.
1.2 Introduction to Strength of tension member by- yielding of section, rupture of net cross-section and block shear.
1.3 Design of axially loaded single angle and double angle tension members with bolted and welded connections.
1.4 Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design compressive stress.
1.5 Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems).
1.6 Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.

2. Design of Steel beams (Limit State Method)

2.1 Standard beam sections, Bending stress calculations
2.2 Design of laterally restrained simple I section beams
2.3 Check for shear and deflection as per IS 800.

3. Design of Reinforced Concrete Beams by Limit State Method

3.1 Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456
3.2 Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section
3.3 Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of A_{st} and A_{sc}.

4. Shear, Bond and Development length in Design of RCC member

4.1 Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement
4.2 Types ofbond, Bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90^0 hook, Lapping of bars.
4.3 Simple numerical problem on: Shear reinforcement, Adequacy of section for shear.
4.4 Introduction to serviceability limit state check

5. Design of axially loaded RCC Column

5.1 Definition and classification of column, Limit state of compression members, Effective length of column.
5.2 Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc.
5.3 Design of axially loaded short column - Square, Rectangular, and Circular only.

SUGGESTED LEARNING RESOURCES

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam P., Design of Steel Structures, S. Chand and Company, Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.
5. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
7. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

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ESTIMATING , COSTING AND VALUATION

Course Code	CE 5002 (Same as CC/CV 5002)
Course Title	Estimating and Costing
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

COURSE OUTCOMES

After completing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

COURSE CONTENT

1. Fundamentals of Estimating and Costing

1. Estimating and Costing –
   - 1.1.1 Meaning,
   - 1.1.2 Purpose
   - 1.1.3 Administrative approval
   - 1.1.4 Technical Sanction
   - 1.1.5 Budget provision

1.2 Types of estimates with definition & purpose
   - 1.2.1. Approximate estimate
   - 1.2.1 Detailed estimate

1.3 Types and Uses of Estimates:
   - 1.3.1 Revised estimate
   - 1.3.2 Supplementary estimate,
   - 1.3.3 Repair and maintenance estimate
   - 1.3.4 Renovation estimate.

1.4 Roles and responsibility of Estimator.

1.5 Checklist of items in load bearing and framed structure.

1.6 Standard formats of Measurement sheet, Abstract sheet, Face sheet.

1.7 Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200.

1.8 Rules for deduction in different category of work as per IS:1200.

1.9 Description / specification of items of building work as per PWD /DSR.

2. Approximate Estimates

2.1 Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numericals)

3. Detailed Estimate

3.1 Detailed Estimate-

- 3.1.1 Data required for detailed estimate –
  - 3.1.1.1 Civil cost
  - 3.1.1.2 GST
  - 3.1.1.3 Contingencies
  - 3.1.1.4 Supervision charges

3.1.1.5 Agency charges
3.1.1.6 Procedure for preparation of detailed estimate- Taking out quantities and Abstracting.

3.2 Methods of Detailed Estimate-
3.2.1 Unit quantity method
3.2.2 Total quantity method
3.2.3 Long wall and Short wall method, Centre line method.

3.3 Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements
3.4 Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc.
3.5 Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.

4. Estimate for Civil Engineering Works

4.1 Earthwork –
4.1.1 Quantities for roads, Embankment and canal by
4.1.1.1 Mid sectional area method, mean sectional area method
4.1.1.2 Prismoidal and trapezoidal formula method.

4.2 Detailed estimate for septic tank, Community well
4.3 Introduction to use of computer /softwares / programmes for detailed estimate Preparation of Civil Engineering Works.

5. Rate Analysis

5.1 Rate Analysis:
1.1.1 Definition
1.1.2 Purpose
1.1.3 Importance

5.2 Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit.
5.3 Procedure for rate analysis.
5.4 Task work- Definition, types. Task work of different skilled labour for different items.
1.5 Categories of labours, their daily wages, types and number of labours for different items of work.
5.5 Transportation charges of materials –
5.5.1 Lead and Lift
5.5.2 Hire charges of machineries and equipments
5.6 Preparing rate analysis of different items of work pertaining to buildings and roads.

SUGGESTED LEARNING RESOURCES

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGraw Hill Education,, New Delhi.
3. Rangwala, S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
4. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
5. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
7. PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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ECONOMIC POLICIES IN INDIA

Course Code	CE 51001 (Same in All Branches of Engg.)
Course Title	Economic Policies in India
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	OE

COURSE LEARNING OBJECTIVES:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

CO1	Understand Indian economics policy, planning strategies
CO2	It will enable to students to comprehend theoretical and empirical development across countries and region for policy purposes
CO3	Development Economics as a discipline encompasses different approach es to the problems of unemployment, poverty, income generation, industrialization from different perspectives
CO4	Able to identify the problems and capable to decide the application for future development
CO5	Analyze economic issues and find solutions to complex economic problems and take correct economic judgment

COURSE CONTENTS:

1. **BASIC FEATURES AND PROBLEMS OF INDIAN ECONOMY:**
   - 1.1. Economic History of India;
   - 1.2. Nature of Indian Economy
   - 1.3. Demographic features and Human Development Index,
   - 1.4. Problems of Poverty, Unemploy-ment, Inflation, income inequality, Blackmoney in India.

2. **SECTORAL COMPOSITION OF INDIAN ECONOMY:**
   - 2.1. Issues in Agriculture sector in India,
   - 2.2. land reforms
   - 2.3. Green Revolution
   - 2.4. agriculture policies of India,
   - 2.5.

3. **INDUSTRIAL DEVELOPMENT,**
   - 3.1. Small scale and cottage industries,
   - 3.2. Industrial Policy,
   - 3.3. Public sector in India,
   - 3.4. Service sector in India.

4. **ECONOMIC POLICIES:**
   - 4.1. Economic Planning in India,
   - 4.2. Planning commission v/s NITI Aayog,
   - 4.3. Five Year Plans,
   - 4.4. Monetary policy in India,
   - 4.5. Fiscal Policy in India,
   - 4.6. Centre state Finance Relations,
   - 4.7. Finance commission in India
   - 4.8. LPG policy in India

5. **EXTERNAL SECTOR IN INDIA**
   - 5.1. India's foreign trade value composition and direction,
   - 5.2. India Balance of payment since 1991,
   - 5.3. FDI in India,

5.4. Impact of Globalization on Indian Economy,
5.5. WTO and India.

REFERENCE BOOKS:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy .S Chand & Co.Ltd. New Delhi.
2. Mishra S. K & V. K Puri (2017). Indian Economy and Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, NewDelhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India ,Oxford University Press.

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ENGINEERING ECONOMICS & ACCOUNTANCY

Course Code	CE 51002 (Same in All Branches of Engg.)
Course Title	Engineering Economics & Accountancy
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	NIL
Course Category	OE

COURSE OBJECTIVES

•To acquire knowledge of basic economicst of a cilitate the process of economic decision making.
•To acquire knowledge on basic financial management aspects.
•To develop the basic skills to analyze financial statements.

COURSE OUTCOMES:

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

CO1	Understand the macro-economic environment of the business and its impact on enterprise
CO2	Understand cost elements of the product and its effect on decision making
CO3	Prepare accounting records and summarize and interpret the accounting datafor managerial decisions
CO4	Understand accounting systems and analyze financial statements using ratio analysis
CO5	Understand the concepts of financial management and investment

COURSE CONTENTS

1. INTRODUCTION:

1.1. Managerial Economics;
1.2. Relationship with other disciplines;
1.3. Firms: Types, objectives and goals;
1.4. Managerial decisions;
1.5. Decision analysis.

2. DEMAND & SUPPLY ANALYSIS:

2.1. Demand;
2.1.1. Types of demand;
2.1.2. Determinants of demand;
2.1.3. Demand function;
2.1.4. Demand elasticity;
2.1.5. Demand forecasting;
2.2. Supply;
2.2.1. Determinants of supply;
2.2.2. Supply function;
2.2.3. Supply elasticity.

3. PRODUCTION AND COST ANALYSIS:

3.1. Production function;
3.2. Returns to scale;
3.3. Production optimization;
3.4. Least cost input; Iso quants;
3.5. Managerial uses of production function;
3.6. Cost Concepts;
3.6.1. Cost function;
3.6.2. Types of Cost;
3.6.3. Determinants of cost;
3.6.4. Short run and Long run cost curves;
3.6.5. Cost Output Decision;
3.6.6. Estimation of Cost.

4. PRICING:

4.1. Determinants of Price;
4.2. Pricing under different objectives and different market structures;
4.3. Price discrimination;
4.4. Pricing methods in practice;
4.5. Role of Government in pricing control.

5. FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT):

5.1. Balance sheet and related concepts;
5.2. Profit & Loss Statement and related concepts;
5.3. Financial Ratio Analysis;
5.4. Cash flow analysis;
5.5. Funds flow analysis;
5.6. Comparative financial statements;
5.7. Analysis & Interpretation of financial statements;
5.8. Investments;
5.9. Risks and return evaluation of investment decision;
5.10. Average rate of return;
5.11. Payback Period;
5.12. Net Present Value;
5.13. Internal rate of return,

REFERENCE BOOKS:

1.Mc Guigan, Moyer and Harris,' Managerial Economics; Applications, Strategy and Tactics', Thomson South Western, 10th Edition, 2005.
2.Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4th edition,2005.
3.Samuelson. Paul A and Nordhaus W. D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
4.Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, NewDelhi, 2007.
5.Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson SouthWestern, 4th Edition, 2001.

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SOLID WASTE MANAGEMENT

Course Code	CE 50031
Course Title	Solid Waste Management
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

COURSE OBJECTIVES

Following are the objectives of this course:

- To know various sources of solid.
- To learn techniques of collection and transportation of solid waste.
- To know various methods of disposal of solid waste.
- To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

COURSE OUTCOMES

After completing this course, student will be able to:

- Identify the sources of solid waste.
- Select the relevant method of collection and transportation of solid waste.
- Suggest an action plan for composting of solid waste.
- Devise suitable disposal technique for solid waste
- Use the relevant method for disposal of Bio-medical and E-waste.

COURSE CONTENT

1. Introduction

1.1 Definition of solid waste
1.2 Different solid waste
  1.2.1 Domestic Waste
  1.2.2 Commercial waste
  1.2.3 Industrial waste
  1.2.4 Market waste
  1.2.5 Agricultural waste
  1.2.6 Biomedical waste
  1.2.7 E-waste, hazardous waste
  1.2.8 Institutional waste
1.3 Sources of solid waste
  1.3.1 Classification of solid waste
    1.3.1.1 Hazardous
    1.3.1.2 Non- hazardous waste.
1.4 Physical and chemical characteristics of municipal solid waste.

2. Storage, Collection and Transportation of Municipal Solid Waste

2.1 Collection, segregation, storage and transportation of solid waste.
2.2 Tools and Equipment-
  2.2.1 Litter Bin
  2.2.2 Broom, Shovels
  2.2.3 Handcarts
  2.2.4 Mechanical road sweepers
  2.2.5 Community bin
    2.2.5.1 Movable
    2.2.5.2 Stationary bin
2.3 Transportation vehicles with their working capacity
  2.3.1 Animal carts
  2.3.2 Auto vehicles
  2.3.3 Tractors or Trailers
  2.3.4 Trucks, Dumpers

2.3.5 Compactor vehicles
2.3.6 Transfer station
2.3.6.1 Meaning
2.3.6.2 Necessity
2.3.6.3 Location.
2.4 Role of rag pickers and their utility for society

3. Composting of Solid Waste

3.1 Concept of composting of waste, Principles of composting process. Factors affecting the composting process.
3.2 Methods of composting
3.2.1 Manual Composting
3.2.1.1 Bangalore method
3.2.1.2 Indore Method
3.2.2 Mechanical Composting
3.2.2.1 Dano Process
3.2.2.2 Vermi composting

4. Techniques for Disposal of Solid Waste

4.1 Solid waste management techniques
4.1.1 solid waste management hierarch
4.1.2 waste prevention
4.1.3 waste reduction techniques
4.2 Land filling technique, Factors to be considered for site selection, Land filling methods-Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill, Advantages and disadvantages of landfill method, Recycling of municipal solid waste
4.3 Incineration of waste: Introduction of incineration process,
4.3.1 Types of incinerators –
4.3.1.1 Flash,
4.3.1.2 Multiple chamber Incinerators,
4.3.2 Products of incineration process with their use,
4.3.2.1 Pyrolysis of waste
4.3.2.1.1 Definition
4.3.2.1.2 Methods

5 Biomedical and E-waste management

1.1 Definition of Bio medical Waste.
1.2 Sources and generation of Biomedical Waste and its classification
1.3 Bio medical waste Management technologies.
1.4 Definition, varieties and ill effects of E- waste,
1.5 Recycling and disposal of E- waste.

SUGGESTED LEARNING RESOURCES

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed. 2018
2. Bhide, A. D.,Solid Waste Management, Indian National Scientific Documentation Centre, New Delhi.
3. George Techobanoglous, Kreith, Frank.,Solid Waste, McGraw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

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BUILDING SERVICES AND MAINTENANCE

Course Code	CE 50032 (Same as CC 50032)
Course Title	Building Services and Maintenance
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

COURSE OBJECTIVES

Following are the objectives of this course:

- To know the procedure for classifying various types of building services.
- To know the fire safety requirements for multi-storeyed building.
- To devise suitable plumbing system for given type of building.
- To understand the procedure for rain water harvesting and solar water heater.
- To know the system for designing lighting, ventilation and acoustics for any building.

COURSE OUTCOMES

After completing this course, student will be able to:

- Classify various types of building services as per functional requirements.
- Propose the fire safety requirements for multi-storeyed building.
- Devise suitable water supply and sanitation system for given type of building.
- Evaluate the potential of rain water harvesting and solar water heater system for the given type of building.
- Justify the necessity of designing the system of lighting, ventilation and acoustics for the given type of building.

COURSE CONTENT

1. Overview of Building Services

1.1 Introduction to building services,
1.2 Classification of buildings as per National Building code
1.3 Necessity of building services
1.4 Functional requirements of building, Different types of building services i.e. HVAC (Heat, Ventilation and Air Conditioning)
1.5 Escalators and lifts
1.6 Fire safety
1.7 Protection and control
1.8 Plumbing services
1.9 Rain water harvesting
1.10 Solar water heating system
1.11 Lighting, acoustics,
1.12 Sound insulation and electric installation etc.
1.13 Role and responsibility of Building Service Engineer,
1.14 Introduction to BMS (Building Management Services)
1.15 Role of BMS, concept of smart building

2. Modes of vertical communication

2.1 Objectives and modes of vertical communication in building.
2.2 Lifts
- 2.2.1 Different types of lifts and its uses
- 2.2.2 Component parts of Lift-
  - 2.2.2.1 Lift Well
  - 2.2.2.2 Travel
  - 2.2.2.3 Pit, Hoist Way
  - 2.2.2.4 Machine, Buffer
  - 2.2.2.5 Door Locks
  - 2.2.2.6 Suspended Rope

2.2.2.7 Lift Car
2.2.2.8 Landing Door
2.2.2.9 Call Indicators
2.2.2.10 Call Push etc

2.2.3 Design provisions for basic size calculation of space enclosure to accommodate lift services, Safety measures.

2.3 Escalators
2.3.1 Different Types of Escalators and its Uses
2.3.2 Components of escalators
2.3.3 Design provisions for basic size calculation of space enclosure to accommodate escalator services, Safety measures.

2.4 Ramp
2.4.1 Necessity
2.4.2 Design consideration
2.4.3 Gradient calculation
2.4.4 Layout and Special features required for physically handicapped and elderly

3. Fire Safety

3.1 Fire protection requirements for multi-storeyed building
3.2 Causes of fire in building
3.3 Fire detecting and various extinguishing systems
3.4 Working principles of various fire protection systems
3.5 Safety against fire in residential and public buildings (multi-storeyed building)
3.6 National Building Code provision for fire safety
3.7 Fire resisting materials and their properties
3.8 Fire resistant construction
3.9 Procedures for carrying out fire safety inspections of existing buildings
3.10 Provisions for evacuation

4. Plumbing Services

4.1 Importance of plumbing
4.2 AHJ (Authority Having Jurisdiction) approval
4.3 Plumbing Terminology and fixtures: Terms used in plumbing, Different types of plumbing fixtures, shapes/ sizes, capacities, situation and usage, Traps, Interceptors.
4.4 System of plumbing for building water supply: storage of water, hot and cold water supply system.
4.5 System of plumbing for building drainage: Types of drainage system such as two pipe system, one pipe system, types of Vents and purpose of venting, Concept of grey water and reclaimed water.
4.6 Different pipe materials, and jointing methods, fittings, hanger, supports and valves used in plumbing and their suitability.

5. Lighting, Ventilation and Acoustics

5.1 Concept of SWH (Solar water heating), component parts of SWH, various system of SWH (heat transfer, propulsion, passive direct system, active direct system, Do-it-yourself), installation and maintenance
5.2 Concept of lighting, types of lighting (natural and artificial), factors influencing the brightness of room, factors affecting selection of artificial lighting, installation of light (direct, half-direct, indirect, half-indirect and direct-indirect), types of light control (manual switch, remote switch, timer switch and photo-electric cell switch)
5.3 Types oflamps (incandescent, tungsten halogen and electric discharge), Lamp selection as per room sizes
5.4 Concept of ventilation, necessity and Types of ventilation
5.5 Building Acoustic, Objectives, acoustic Control in a building, acoustic material (porous absorber and cavity resonator)

SUGGESTED LEARNING RESOURCES

1. Patil, S. M., Building Services, Seema Publication, Mumbai.
2. Mantri and Sandeep., The A to Z of Practical Building Construction and its Management, Satya Prakashan, New Delhi**.**
3. Bag S P, Fire Services in India: History, Detection, Protection, Management, Mittal Publications, New Delhi.
4. Deolalikar,S. G., Plumbing Design and Practice, McGraw-Hill,
5. Akhil Kumar Das., Principles of Fire Safety Engineering: Understanding Fire and Fire Protection, PHI Learning Pvt. Ltd, New Delhi.
6. Shraman **N L**, Solar panel installation guide & user manual**,**The Memory Guru of India.
7. Gupta M K, Practical handbook on building maintenance - Civil works, Nabhi Publications.
8. BIS., National Building Code Part1, 4, 8, 9., Bureau of Indian Standard, New Delhi
9. BIS., IS 12183(Part 1):1987 Code of practice for plumbing in multistoried buildings., Bureau of Indian Standard, New Delhi
10. BIS., 2008 Uniform plumbing code – India (UPC-I)., Bureau of Indian Standard

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GREEN BUILDING AND ENERGY CONSERVATION

Course Code	:	CE 50041 Same as AR/CC/CV 50041
Course Title	:	Green Building and Energy Conservation
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

COURSE OBJECTIVES

Following are the objectives of this course:

- To know various aspects of green buildings
- To use different steps involved in measuring environmental impact assessment.
- To relate the construction of green building with prevailing energy conservation policy and regulations.
- To know and identify different green building construction materials.
- To learn different rating systems and their criteria.

COURSE OUTCOMES

After completing this course, student will be able to:

- Identify various requirements for green building.
- Use different steps in environmental impact assessment.
- Relate the construction of green building with prevailing energy conservation policy and regulations.
- Supervise the construction of green building construction using green materials.
- Focus on criteria related to particular rating system for assessment of particular Green building.

COURSE CONTENT

1. Introduction to Green Building and Design Features

1.1 Definition of Green Building, Benefits of Green building, Components/features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.

1.2 Site selection strategies, Landscaping, building form, orientation, building envelope and fenestration, material and construction techniques, roofs, walls, fenestration and shaded finishes, advanced passive heating and cooling techniques, waste reduction during construction

2. Energy Audit and Environmental Impact Assessment (EIA)

2.1 Energy Audit:
- 2.1.1 Meaning
- 2.1.2 Necessity
- 2.1.3 Procedures
- 2.1.4 Types,
- 2.1.5 Energy Management Programs

2.2 Environmental Impact Assessment(EIA):
- 2.2.1 Introduction
- 2.2.2 EIA regulations
- 2.2.3 Steps in environmental impact assessment process
- 2.2.4 Benefits of EIA
- 2.2.5 Limitations of EIA
- 2.2.6 Environmental clearance for the civil engineering projects

3. Energy and Energy conservation

3.1 Renewable Energy Resources:
- 3.1.1 Solar Energy
- 3.1.2 Wind Energy
- 3.1.3 Ocean Energy
- 3.1.4 Hydro Energy
- 3.1.5 Biomass Energy

3.2 Non-renewable Energy Resources:
- 3.2.1 Coal,

3.2.2 Petroleum,
3.2.3 Natural Gas,
3.2.4 Nuclear Energy,
3.2.5 Chemical Sources of Energy,
3.2.6 Fuel Cells,
3.2.7 Hydrogen,
3.2.8 Biofuels.

3.3 Energy conservation:
3.3.1 Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency.

4. Green Building

4.1 Principles
4.1.1 Principles and planning of Green building
4.2 Features
4.2.1 Salient features of Green Building,
4.2.2 Environmental design (ED) strategies for building construction.
4.3 Process:
4.4.1 Improvement in environmental quality in civil structure
4.4 Materials:
4.4.1 Green building materials and products
4.4.1.1 Bamboo
4.4.1.2 Rice husk ash concrete
4.4.1.3 plastic bricks
4.4.1.4 Bagasse particle board
4.4.1.5 Insulated concrete forms
4.4.2 reuse of waste material
4.4.2.1 Plastic
4.4.2.2 rubber
4.4.2.3 Newspaper wood
4.4.2.4 Nontoxic paint
4.4.2.5 Green roofing

5. Rating System

5.1 Introduction to(LEED) criteria,
5.2 Indian Green Building council (IGBC) Green rating,
5.3 Green Rating for Integrated Habitat Assessment. (GRIHA) criteria
5.4 Heating Ventilation Air Conditioning (HVAC) unit in green Building
5.5 Functions of Government organization working for Energy conservation and Audit(ECA)-
5.6 National Productivity council(NPC)
5.7 Ministry of New and Renewable *Energy* (MNRE)
5.8 Bureau of Energy efficiency (BEE)

SUGGESTED LEARNING RESOURCES

1. Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hoboken, New Jersey.
2. Chauhan, D S Sreevasthava, S K., Non-conventional Energy Resources, New Age International Publishers, New Delhi.
3. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
4. Jagadeesh, K S, Reddy Venkatta Rama &Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.
5. Sam Kubba., Handbook of Green Building Design and Construction, Butterworth-Heinemann.
6. Means R S, Green Building - Project Planning and Cost Estimating, John Wiley & Sons
7. Sharma K V, Venkataseshaiah P., Energy Management and Conservation, IK International.

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ADVANCED CONSTRUCTION TECHNOLOGY

Course Code	:	CE 50042 Same as AR 50042
Course Title	:	Advanced Construction Technology
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

COURSE OBJECTIVES

Following are the objectives of this course:

- To gain knowledge on different materials in advanced construction
- To know different methods in concreting.
- To know the relevance of advanced construction methods for particular site condition.
- To identify the requisite hoisting and conveying machinery for the given situation.

COURSE OUTCOMES

After completing this course, student will be able to:

- Use relevant materials in advanced construction of structures.
- Use relevant method of concreting and equipment according to type of construction.
- Apply advanced construction methods for given site condition.
- Select suitable hoisting and conveying equipment for a given situation.
- Identify advanced equipment required for a particular site condition

COURSE CONTENT

1. Advanced Construction Materials

1.1 Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
1.2 Plastics: Use and properties of PVC, RPVC, HDPE, FRP, GRP.
1.3 Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plaster boards, micro-silica, waterproofing materials, adhesives.
1.4 Use of waste products and industrial byproducts in bricks, blocks, concrete and mortar.

2. Advanced Concreting Methods and Equipments

2.1 Ready Mix Concrete: Necessity and use of readymix concrete. Products and equipments for ready mix concrete plant. Conveying of ready mix concrete, transit mixers.
2.2 Vibrators for concrete consolidation: Internal, needle, surface, platform and form vibrators.
2.3 Underwater Concreting: Procedure and equipments required for Tremie method, Drop bucket method. Properties, workability and water cement ratio of the concrete.
2.4 Special concrete: procedure and uses ofspecial concretes: Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, shotcreting.

3. Advanced Technology in Constructions

3.1 Construction of bridges and flyovers: Equipments and machineries required for foundation and super structure.
3.2 Construction of multi-storeyed Building: Equipments and machinery required for construction of multi-storeyed building such as use of lifts, belt conveyers, pumping of concrete.
3.3 Prefabricated construction: Methods of prefabrication, Plant fabrication and site fabrication, All prefabricated building elements such as wall panels, slab panels, beams, columns, door and window frames etc. Equipments and machineries used for placing and Jointing of prefabricated elements.
3.4 Strengthening of embankments by soil reinforcing techniques using geo-synthetics

4. Hoisting and Conveying Equipments

4.1 Hoisting Equipments: Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Hand operated crane, Locomotive crane, Tower crane, Lattice Girder, Winches, Elevators, ladders. Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes. (only introduction & uses)
4.2 Conveying Equipments: Working of belt conveyers, types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

5 Miscellaneous Machineries and Equipments

5.1 Excavation Equipments: bull dozers, scrapers, graders, Clam Shell, trenching equipment, Tunnel boring machine, Wheel mounted belt loaders, power shovels, JCB, and drag lines. (only introduction & uses)

5.2 Compacting Equipments: different types of rollers such as plain rollers, ship footed rollers, vibratory, pneumatic rollers rammers.(only introduction & uses)

5.3 Miscellaneous Equipments: Working and selection of equipments: Pile driving equipments, Pile hammers, Hot mix bitumen plant, bitumen paver, grouting equipment, guniting equipments, floor polishing and cutting machine(only introduction & uses) selection of drilling pattern for blasting, Bentonite/mud slurry in drilling, Explosives for blasting, Dynamite, process of using explosives.

SUGGESTED LEARNING RESOURCES

1. Sharma S C andDeodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Chudly, R., Construction Technology Vol. I to II, ELBS-Longman Group.
3. Peurifoy, R. L., Construction Planning Equipment and Methods,McGraw Hill Co. Ltd. New York.
4. Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
5. Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
6. Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
7. Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.
8. Rangawala,S. C., Construction of Structures and Management of works, Charotar Publication, Anand.
9. Ghose,D. N., Materials of Construction, McGraw Hill Publishing Co, New Delhi.

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DESIGN OF STEEL AND RCC STRUCTURES LAB

Course Code	CE 50005 (Same as CC 5005)
Course Title	Design of Steel and RCC Structures Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn the concept of limit state design of tension and compression steel members.
- To understand design of steel beams.
- To learn the concept of limit state design of RCC beams.
- To know the limit state design of RCC columns.

COURSE OUTCOMES

After completing this course, student will be able to perform:

- Design of steel tension and compression member.
- Design of steel beams including check for shear.
- Design of singly and doubly reinforced RCC beam.
- Design of shear reinforcement in RC beams.
- Design of RCC column as per IS 456.

LIST OF PRACTICAL TO BE PERFORMED

1	Draw any five commonly used rolled steel sections and five built up sections.
2	Summarize the provisions of IS 800 required for the design of tension member in report form.
3	Compile relevant clauses from IS 800 required for the design of a compression member and submit it in report form.
4	Draw sketches for single and double lacing of given built up columns.
5	Draw sketches for battening of given built up columns.
6	Prepare a report on the IS 800 provisions pertaining to design of lacing and battening along with its significance.
7	Draw cross section, strain diagram and stress diagram for singly reinforced section.
8	Draw cross section, strain diagram and stress diagram for doubly reinforced section.
9	Design simply supported I section steel beam for UDL.
10	Design beams section for shear as per IS 800 provisions.
11	Draw sketches of different types of column footings.
12	Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements.
13	Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.
14	Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.
15	Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.

SUGGESTED LEARNING RESOURCES

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

5. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
7. Krishna Raju, andN.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

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ESTIMATION, COSTING AND VALUATION LAB

Course Code	CE 5006 (Same as CC/CV 5006)
Course Title	Estimation and Costing Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

COURSE OUTCOMES

After completing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

LIST OF PRACTICAL TO BE PERFORMED

1	Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2	Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3	Study of items with specification given in the DSR (for any ten item)
4	Recording in Measurement Book (MB) for any four items
5	Prepare bill of quantities of given item from actual measurements. (any four items).
6	Prepare approximate estimate for the given civil engineering works.
7	Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR (1BHK Building with staircase).
8	Prepare detailed estimate from the given set of drawings using "standard measurement and abstract format" for RCC framed structure using description of item from DSR along with face sheet and prepare quarry chart, lead statement (G+1 Building) .
9	Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule (footing, column, beam, lintel with chajja, slab)
10	Prepare rate analysis for the given five item of works.
11	Prepare detailed estimate of road of one kilometre length from the given drawing.
12	Prepare detailed estimate of small Septic tank from the given set of drawings.
13	Prepare detailed estimate of well from the given set of drawing.
14	Use the relevant software to prepare detailed estimate of a Road.
15	Use the relevant software to prepare detailed estimate of a residential building.

SUGGESTED LEARNING RESOURCES

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors
2. Peurifoy, Robert L. Oberlender,Garold, Estimating construction cost (fifth edition), McGraw Hill Education,, New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House, Anand.
4. Birdie,G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. Delhi.
5. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering, MonojitChakraborti, Kolkata.

7. PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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