

**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

**CE-7001 Advance Structural Design –I (RCC)**

**For credits & marks refer scheme**

**Unit - I**

Design of Multistory Buildings - Sway and non-sway buildings, shear walls and other bracing elements.

**Unit - II**

Earth Retaining Structures: Cantilever and counter fort type retaining walls.

**Unit - III**

Water Tanks: Tanks on ground and underground tanks: square, rectangular, circular tanks, overhead tanks: circular and intze tanks.

**Unit - IV**

Silos and Bunkers: Introduction, design of rectangular, square and circular bunkers, design of silos by Airy's theory and Janssen's theory.

**Unit - V**

T-beam & Slab bridges- for highway loading (IRC Loads). Prestressing concepts materials, systems of prestressing & losses. Introduction to working and limit state design.

**Reference books :**

1. R.C.C. by O.P. Jain Vol. II
2. R.C.C. by B.C. Punmia
3. Essentials of Bridge Engineering – D.J. Victor
4. Bridge Engineering - Ponnuswamy
5. Advanced R.C.C. Design by N.K. RAJU
6. N.KrishnaRaju, Prestressed Concrete, Tata McGraw Hill, New Delhi.
7. Pre stresses concrete – T.Y. Lin

Relevant IS codes

**Practical work:**

The detailed design and drawing of various structural components given below as per the syllabus:

1. Design of multistory buildings (sway and non-sway buildings), shear walls and other bracing elements.

2. Cantilever and counterfort type of retaining walls
3. Water tanks: underground and on ground tanks (square, rectangular, circular), overhead tanks and intze tanks
4. Silos (rectangular, square and circular)
5. Bunkers (rectangular, square and circular)
6. T-beam
7. Slab bridges for highway as per IRC loading
8. Prestressed concrete members

# **RAJIV GANDHI PROUDYOGIKI VISHWA VIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

## **CE-7002 Structural Design –II (Steel)**

### **Unit I**

Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, Design of structural connections - bolted, riveted and welded connections.

### **Unit II**

Design of compression members, tension members, roof trusses - angular & tubular, lattice girders.

### **Unit III**

Design of simple beams, built-up beams, plate girders and gantry girders.

### **Unit IV**

Effective length of columns, design of columns - simple and compound, lacing and battens. Design of footings for steel structures, grillage foundation.

### **Unit V**

Design of industrial building frames, multistory frames, bracings for high rise structures, design of transmission towers.

NOTE: - All the designs for strength and serviceability should strictly be as per the latest version of IS:800.

### **References books**

- i) Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
- ii) Design of steel structures by P. Dayaratnam
- iii) Design of steel structures Vol. I & II by Ramchandra
- iv) Design of steel structures by L.S. Negi
- v) Design of steel structures by Ramammutham
- vi) Design of steel structures by Punmia
- vii) Design of steel structures – N. Subramanian
- viii) Relevant IS codes

### **Practical work:**

The detailed design and drawing of various structural components given below as per the syllabus:

1. Riveted and welded connections
2. Design of compression
3. Design of tension members
4. Design of simple and compound beams
5. Design of lattice girder

6. Design of plate girder
7. Design of gantry girder
8. Design of simple and built-up/ compound column with lacing and battens
9. Design of various types of steel footings ex. slab base, gusseted base, grillage footing
10. Design of various types of bracing (as tension or compression members)
11. Design of industrial building frames, multistory frames.
12. Field/site visits.

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

**CE-7003 Modern Construction Technique & Equipment**

**Unit I Modern Construction Materials:** Study of advance building materials like, aluminum, glass, fabric, various types of finishes & treatments, construction chemicals – sealants, engineering grouts, mortars , admixtures and adhesives

**Unit II Polymers** in civil engineering-structural plastics and composites- polymer membranes-coatings-adhesives, non - weathering materials-flooring and facade materials- glazed brick, photo catalytic cement, acid etched copper and composite fiber metals-metals and special alloys of steel - water jet cut stainless steel, mill slab steel, tension rods assemblies and cast iron, heat treatment in steels, tendons.

**Unit III Construction methods:** precast flat panel system, 3d volumetric construction, tunnel boring methods, slip form work, precast foundations .fabrication of pre cast and pre stressed components, reinforcing steel: types, bending, placing, splicing and spacing, tendons- soil improvement - mechanical, thermal and chemical.

**Unit IV Construction Equipment's:** equipment for excavating, dredging, trenching, tunneling, drilling, blasting-equipment for compaction-erection equipment- types of pumps used in construction-equipment for dewatering and grouting-foundation and pile driving equipment , forklifts and related equipment-portable material -conveyors-hauling equipment.

**Unit V Smart Materials:**concept and types, sensing technology-types of sensors -physical measurement using piezoelectric strain measurement, piezoelectric and electrostrictive material - magneto structure material, shape memory alloys, electro rheological fluids

## **References Books:**

1. Shan Somayaji, Civil Engineering Materials 2nd Edition, Prentice Hall Inc., 2001.
2. Mamlouk M.S. and Zaniewski J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.
3. Derucher K., Korfiatis G. and Ezeldin S., Materials for Civil and Highway Engineers ", Prentice Hall Inc., 1999. 4th Edition
4. Peurifoy R.L., Ledbetter W. B.and Schexnayder C.,Construction Planning, Equipment and Methods ", 5th Edition, McGraw Hill, Singapore, 1995.
5. Sharma S.C. Construction Equipment and Management, Khanna Publishers New Delhi, 1988.

6. Deodhar S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988.
7. Mahesh Varma, Construction Equipment and its Planning and Application, Metro-politan Book Company, New Delhi-, 1983
8. Srinivasan A.V and Michael McFarland. D, Smart Structures - Analysis and Design, Cambridge University Press.
9. Mukesh V. Gandhi, Brian S. Thompson, Smart Materials and Structures, Springer,

**Practical work:**

1. Study of basic properties and tests on modern materials
2. Collect the specification of various modern construction materials and equipment available in market
3. Prepare and give a presentation on any of the topic content in syllabus.

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

## **Elective-III CE-7004 (1) Pavement Design**

### **Unit -I.**

Equivalent Single Wheel Load (ESWL): Definition, calculation of ESWL, repetition of loads and their effects on the pavement structures.

### **Unit -II.**

Flexible Pavements: Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory, Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

### **Unit -III.**

Rigid Pavements: Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

### **Unit -IV.**

Rigid pavement design: IRC method, Fatigue analysis, PCA chart method, joints, design and construction & types, AASHTO Method, Reliability analysis.

### **Unit -V.**

Evaluation and Strengthening of Existing Pavements: Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

### **Reference Books:-**

1. Principles of pavement design by E.J. Yoder & M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidelines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

**Elective-III CE-7004 (2) Marine Construction**

1. History of water transportation at world level and at national level development and policy, classification of harbours, natural and artificial. Major ports in India, administrative set up.
2. Harbour Planning: Harbour components, ship characteristics, characteristics of good harbour and principles of harbour planning, size of harbour, site selection criteria and layout of harbours. Surveys to be carried out for harbor planning
3. Natural Phenomena: Wind, waves, tides formation and currents phenomena, their generation characteristics and effects on marine structures, silting, erosion and littoral drift.
4. Marine Structures: General design aspects, breakwaters -function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories –function, types, suitability, design and construction features.
5. Docks and Locks: Tidal basin, wet docks-purpose, design consideration, operation of lock gates and passage, repair docks -graving docks, floating docks.

## **References books –**

1. A COURSE IN DOCS AND HARBOURS: S. P. BINDRA
2. HARBOUR DOCS AND TUNNELIING: R. SRINIVASAN
3. DOC AND HARBOUR ENGINEERING: OZA



# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

**Elective-III CE-7004 (3) Air and Noise Pollution Control**

## **UNIT I: INTRODUCTION TO AIR POLLUTION**

Air Pollution, Definition, Air Pollution and Global Climate, Units of measurements of pollutants, Air quality criteria, emission standards, National ambient air quality standards, Air pollution episodes.

## **UNIT II: SOURCES, CLASSIFICATION AND EFFECTS**

Sources and classification of air pollutants, Manmade, Natural sources, Type of air pollutants, Pollution due to automobiles, Analysis of air pollutants. Air pollution and its effects on human beings, plants and animals, Economic effects of air pollution.

## **UNIT III: AIR QUALITY SAMPLING AND MONITORING**

Ambient air sampling, Stack sampling, instrumentation and methods of analysis of gaseous pollutants, Meteorology, legislation for control of air pollution and automobile pollution.

## **UNIT IV: AIR POLLUTION CONTROL MEASURES**

Control equipment, Particulate control methods, Bag house filter, Settling chamber, cyclone separators, inertial devices, Electrostatic precipitator, scrubbers, Control of gaseous emissions, Absorption, Adsorption equipment's, adsorption and combustion devices.

## **UNIT V: NOISE POLLUTION AND ITS CONTROL**

Sources of noise, Units and Measurements of Noise, Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise, Noise measuring equipment, Effects of noise pollution, Prevention and control of noise pollution.

### **References books –**

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited, 2000.
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt. Ltd, New Delhi, 1993.
3. G.K. Nagi, M.K. Dhillon, G.S. Dhaliwal, Commonwealth Publishers, Noise Pollution.
4. S.K. Garg, Khanna publishers, Sewage Disposal and Air Pollution Engineering.
5. S.M. Khopkar, Environmental pollution analysis, New Age International Publis.

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

## **Elective-III CE-7004 (4) Cost-Effective & Eco-Friendly Construction**

### **UNIT-I**

Concepts of energy efficient & environment friendly materials and techniques:

Cost effective materials: Soil, Fly ash, Ferro-cement, Lime, Fibers, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer.

Energy Efficient & Environment friendly building material products:

Walls - Stabilized and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferro cement partitions.

Roofs – Pre-cast R.C. Plank & Joists roof, Pre-cast channel roof, Pre-cast L-panel roof, Pre-cast Funicular shells, Ferro cement shells, Filler Slab, SeasalFibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

Green Materials, Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials

### **UNIT-II**

Cost effective construction techniques and equipments:-

(a)Techniques: Rat trap bond construction, Energy Efficient roofings, Ferro cement technique, Mud Technology.

(b) Equipments: Brick moulding machine, Stabilized soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferro cement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

### **UNIT-III**

Cost effective sanitation:

(a)Waste water disposal system

(b)Cost effective sanitation for rural and urban areas

(c)Ferrocement Drains

### **UNIT-IV**

Low Cost Road Construction:

Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

### **UNIT-V**

Cost analysis and comparison:

(a)All experimental materials

(b)All experimental techniques

Green Building rating systems

**Reference books:**

1. Alternative Building Materials and Technologies – K S Jagadeesh, B V Venkatta Rama Reddy & K S NanjundaRao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – AskoSarja –CRC Press
3. Non-conventional Energy Resources –D S Chauhan and S K Sreevasthava – New Age International Publishers
4. Buildings How to Reduce Cost – Laurie Backer - Cost Ford
5. Lynne Elizabeth, Cassandra Adams Alternative Construction : Contemporary Natural BuildingMethods ”, Softcover, Wiley & Sons Australia, Limited, John,2005
6. Givoni, “Man, Climate, Architecture, Van Nostrand, New York, 1976.
7. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery,John Wiley & Sons,2005.
8. Eugene Eccli- Low Cost, Energy efficient shelter for owner & builder, Rodale Press, 1976

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

## **Elective-IV CE-7005 (1) Infrastructure Engineering**

### **Unit I**

Infrastructure: Definitions of infrastructure, Governing Features, Historical overview of Infrastructure development in India, Infrastructure Organizations & Systems.

### **Unit II**

Infrastructure Planning: Typical infrastructure planning steps, Planning and appraisal of major infrastructure projects, Screening of project ideas, Life cycle analysis, Multi-criteria analysis for comparison of infrastructure alternatives, Procurement strategies, Scheduling and management of planning activities, Infrastructure Project Budgeting and Funding, Regulatory Framework, Sources of Funding.

### **Unit III**

Project Management in Construction: Introduction to project management processes - Initiating, Planning, Executing, Controlling, and Closing processes; Project Integration Management - Project plan development, Project plan execution, and Overall change control; Project Scope Management - Initiation, Scope planning, Scope definition, Scope verification, and Scope change control.

### **Unit IV**

Contracts and Management of Contracts: Engineering contracts and its formulation, Definition and essentials of a contract, Indian Contract Act 1872, types of contracts and clauses for contracts, Preparation of tender documents, Issues related to tendering process, Awarding contract.

### **Reference books:**

1. A. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
1. J. Parkin and D. Sharma, Infrastructure planning, Thomas Telford, London, 1999.
2. P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009.
3. S. M. Levy, Project management in construction, 5th ed., McGraw Hill, New York, 2007. • PMI, A guide to the project management body of knowledge, 3rd ed., Project Management Institute, Pennsylvania, 1996.
4. M. Mawdesley, W. Askew and M. O'Reilly, Planning and controlling construction projects, Addison Wesley Longman Limited, Essex, 1997.
5. Vasant Desai, "Project Management", Himalaya Publishing, 1st Edition, 2010

6. Ronald W Hudson, "Infrastructure Management: integrating design, Construction, maintenance, rehabilitation and renovation", MGH, 1st Edition, 1997
7. Codes of Practice and Standard Specifications" of AP PWD, CPWD, MES etc.
8. Grig N. S., "Infrastructure Engineering and Management", Wiley-Interseience.

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

## **Elective-IV CE-7005 (2) Earthquake Resistant Design**

### **Unit 1 Engineering Seismology**

Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, Earthquake measurement parameters, Characteristics of earthquake and its quantification- Magnitude and Intensity scales, Seismic instruments. Seismic zoning map of India.

### **Unit 2 Response Spectrum**

Response history and strong motion characteristics. Response Spectrum- elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design. Computation of seismic forces in multi-storeyed buildings - using procedures as per codal provisions.

### **Unit 3 Aseismic Structural Modelling**

Structural configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls,

### **Unit 4 Design of structure for earthquake resistance**

Seismic design philosophy, Load combinations, Ductility and energy absorption in buildings. Confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Lateral load resisting structural systems.

### **Unit 5 Seismic control of structures**

Introduction, concept and types of seismic control systems as active, passive and semi-active systems. Requirements of efficient earthquake resistant structural system, damping devices, base isolation systems. Retrofitting of structures.

**Reference Books:**

1. Chopra Anil Kumar, Dynamics of Structures - Theory and Application to Earthquake Engineering, Pearson Education.
2. Hosur Vinod, Earthquake Resistant Design of Building Structures, Wiley (India).
3. Duggal, S. K., Earthquake Resistant Design of Structures, Oxford University Press.
4. Agarwal Pankaj, Shrikande Manish, Earthquake resistant design of structures, Prentice Hall of India, New Delhi India.
5. Pauley & Priestly, Seismic design of reinforced concrete and masonry buildings, John Wiley & Sons.
6. Stratta.J. L, Manual of Seismic Design, Prentice-Hall India Pvt Ltd.
7. Kramer.S. L., Geotechnical Earthquake Engineering, Prentice-Hall India Pvt Ltd.
8. All relevant IS codes.

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

**Elective-IV CE-7005 (3) Urban & Town Planning**

## **UNIT-I**

Definition and classification of urban areas - Trend of urbanization - Planning process - Various stages of the planning process - Surveys in planning. Plans - Delineation of planning areas. utility of spaces, future growth etc. Role of “Urban Planner ”in planning and designing in relation with spatial organization, utility, demand of the area and supply

## **UNIT-II**

Plan implementation- Urban Planning agencies and their functions - Financing- Public, private, Nongovernmental organizations- Public participation in Planning. Development control regulations. sustainability and rationality in planning, Components of sustainable urban and regional development, Emerging Concepts: Global City, inclusive city, Safe city, etc. City of the future, future of the city.

## **UNIT-III**

Town and country planning act- Building bye-laws. Elements of City Planning, Zoning and land use, Housing. Introduction to landscaping, importance , objectives, principles, elements, Urban Planning standards Urban renewal for quality of life and livability.

## **UNIT-IV**

Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems. Legal Issues in Planning and Professional Practice, Concepts and contents related to planning provision regarding property rights, Concept of Arbitration, State and Central government to deal with various matters concerning Town and Country Planning.

mechanism for preparation of DP: Land Acquisition Rehabilitation and Resettlement Act 2013.

## **UNIT-V**

Types of Development plans: Master Plan, City Development Plan, Structure Plan ,housing, land use, Water Supply & sanitation, etc., Planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc).,



**References:-**

1. Urban Planning: Theory & Practice By M. Pratap Rao
2. Urban Transportation: Planning, Operation and Management by S. Ponnuswamy, D. Johnson Victor
3. Sustainable Urban Planning in India by Joy Sen
4. Urban Planning in India by Amiya Kumar Das

# **RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

Credit Based Grading System

**Civil Engineering, VII-Semester**

**Elective-IV CE-7005 (4) Life Cycle Costing of Structures**

## **UNIT 1**

Introduction ,Life-Cycle Cost Analysis (Lcca) Method, Costs ,Initial Costs-Purchase, Acquisition, Construction Costs, Fuel Costs, Operation, Maintenance, And Repair Costs ,Replacement Costs, Residual Values—Resale Or Salvage Values Or Disposal Costs, Finance Charges—Loan Interest Payments ,Non-Monetary Benefits Or Costs

## **UNIT 2**

Parameters for Present-Value Analysis, Discount Rate, Cost Period(S), Discounting Convention, Treatment of Inflation

## **UNIT 3**

Life-Cycle Cost Calculation, Supplementary Measures, Evaluation Criteria, Uncertainty Assessment in Life-Cycle Cost Analysis, sensitivity Analysis, Break-Even Analysis

## **UNIT 4**

Design and Analysis Tools, Applications, Relevant Codes and Standards, LCCA Guidelines for OMB Projects, LCCA Guidelines for FEMP Projects

## **UNIT 5**

Case study for application of LCC techniques and use of various software for LCC.

## **Books**

1. Life Cycle Costing For Construction by [J.W. Bull](#) , Taylor & Francis.
2. A Life Cycle Approach to Buildings By Niklaus Kohler, Holger König, Johannes Kreissig, Thomas Lützkendorf
3. Life-Cycle Cost Analysis of Built Assets by Whyte Andrew