# Sant Gadge Baba Amravati University, Amravati

**B.E Civil Engineering V & VI Semester Syllabus (C.G.P.A System )**

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## V Semester

### 5CE01 : Design Of Reinforced & Prestressed Concrete Structures

**Learning Objectives of Subject:**

- To understand basic concept of limit state method.
- To understand behavior of slab under external loading.
- To understand behavior of staircase and retaining wall.
- To understand behavior of column and footing.
- To learn concept of grid slab and earthquake resistant construction.
- To introduce basic concept of prestressed concrete.

**Course outcomes:**

At the end of the subject the students will be able -

- To analyze and design of rectangular section.
- To analyze and design of slab.
- To analyze and design of staircase and retaining wall.
- To analyze and design of column and footing.
- To understand grid slab and ductile detailing.
- Explain the general behavior of PC sections under external load.

**SECTION-A**

**Unit I:**

1) Introduction to limit state method, basic concept and design of singly and doubly reinforced rectangular sections.
2) Analysis and design of flanged sections.

**Unit II:**

1) Analysis and design of one way continuous slabs
2) Analysis and design of two way slab.

**Unit III:**

1) Design of Dog legged staircase.
2) Design of cantilever retaining walls (Horizontal backfill only).

## SECTION-B

**Unit IV:**

1) Analysis and design of columns for axial load, uniaxial and biaxial bending.

2) Design of isolated footings: square and rectangular subjected to axial load and uniaxial bending moment only (with uniform depth only).

**Unit V:**

1) Design of Grid Slab by I.S. code method.

2) Detailing for earthquake resistant construction. Introduction, Cyclic behavior of concrete and reinforcement, significance of Ductility, Ductile detailing for beams, columns, beam-column joint and footing.

**Unit VI:**

1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress.
2. Analysis of Rectangular and flanged beams.

**Notes:**

1) Students should use IS 456:2000, IS 1343:2012, IS 1893:2016, IS 13920:2016.

2) Field visit on any RCC framed structure & report of the same.

3) Students must be shown video CD, slides, transparencies, and photograph of actual structures.

**Books Recommended:**


1. Ashok K Jain : Reinforced Concrete Limit state Design ( Nem Chand & Bros Roorkee)
2. S.K.Sinha: Reinforced Concrete Design ( M C Graw Hill Education India Pvt Ltd)
3. Devdas Menon, S. UnnikrishnaPillai :Reinforced concrete Design ;Third Edition; McGraw Hill Education
4. Dr.Shah V.L. &Karve S.R. : Limit State Theory & designof Reinforced concrete IS 456:2000( Structurs Publication)
5. Neelam Sharma :Reinforced Cement Concrete design ( S.K.Kataria& Sons)
6. S.S.Bhavikatti :Design of R.C.C. Structural Element (R.C.C. Vol. I)(New Age International Publishers)
7. Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
8. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi

## 5CE02: Surveying & Geomatics

**Course Objectives:**

- To prepare the student to understand applications of curves.
- To enable the students to establish accurate control for photogrammetric survey and to determine accurate locations of points in engineering works
- To equip the candidate with the art, science and technology of cartography and applications of GIS in Mapping Resources.
- To develop the skills in surveying and thematic mapping.

**Course Outcomes:**

Students will be able to

- Understand the use of different types of curves and their field implications.
- Understand the triangulation adjustment.
- Understand the hydrographic survey.
- Acquire skills in handling spatial data base warehousing and mining.
- Understand the surveying with advance instrument like remote sensing, GPS and GIS.

### SECTION- A

**Unit-I:** Curves: Classification, degree of curve, elements of circular and compound curves, theory and methods of setting out simple curves, Instrumental method of setting out compound curves.

**Unit-II:** Triangulation: principles, classification of triangulation system, triangulation figures, their choice of station, phase of signals, towers, satellite station, reduction to center, field work, reconnaissance, Inter-visibility, angular measurements. Basenet, extension of Basenet.

**Unit-III:** Hydrographic surveying: necessity, controls, shore line surveys, gauges, sounding equipment's and procedure of taking soundings, methods of location of sounding, three-point problem in hydrographic surveying, analytical and graphical methods. Underground Surveying: surface alignment, correlation of surface and underground surveys; Weisbach triangle, transferring levels and alignment underground.

## SECTION – B

**Unit-IV:** Elements of photogrammetry: Basic definitions, terrestrial and aerial photography, scale of vertical photograph, Relief and relief displacements, heights from parallel measurements, flight planning, photographs required.

**Unit-V:**1.Remote sensing: Introduction, definitions, remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics 2. GPS: Global positioning system (GPS) introduction, definitions, GPS receivers, antenna, advantages of GPS.

**Unit-VI:** 1. Geographical Information System: Definition and history, Components of GIS, Data structure and formats, Spatial data models – Raster and vector, Data base design- editing and topology creation in GIS, Linkage between spatial and non-spatial data, Introduction to QGIS software. 2. GIS application: Application in Geological Investigations, water resources management, environmental studies, EIA based studies, Land use planning, soil studies and transportation planning.

**Books Recommended:**

1. D. Clark.: Plane and Geodetic Surveying Vol II, CBS Publishers & Distributors Pvt. Ltd,
2.T.P. Kanetkar & S.V.Kulkarni: Surveying and Leveling Part II, Pune Vidyapetth GrahaPrakashan.
3. B.C.Punmia: Surveying Vol. II and III, Tata McGraw-Hill Publishing Company Limited,
4. Kang-tsung Chang: Introduction to Geographic Information Systems, McGraw-Hill Book Company, 2006.
5. B.C. Punmia, Ashok Jain, Arun k. Jain: Higher surveying, Laxmi publications (P), Ltd,
6. Dr. S. Kumar: Basics of remote sensing and GIS, Laxmi publications (P), Ltd

## 5CE03: Numerical Methods and Computer Programming

**Learning Objectives of Subject:**

- To learn the basics of spreadsheets.
- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop skills in programming using C language.

**Learning Objectives of Subject:**

At the end of subject the students will able -

- To use spreadsheet software for solving civil engineering problems.
- To impart knowledge to analyze, solve, design and code numerical method problems using C language.
- To impart knowledge to analyze, solve, design and code civil engineering problems using C language.

### SECTION – A

**Unit-I:**

Spreadsheet software basics, Expressions, Mathematical Functions, Conditional Execution Functions like IF, COUNT, COUNTIF, SUM, SUMIF, AVERAGE, AVERAGEIF, LOOKUP, HLOOKUP. Application to the Civil Engineering Problems.

**Unit-II:**

1. Basic structure of C program, use of library functions, input output statements, flowchart.
2. Decision Control structures and loop Control structures conditional loop and unconditional loop: WHILE, DOWHILE, FOR, IF, IFELSE, NESTEDIF, LADDER IFELSE etc.

**Unit-III :**

1. Type casting, single dimensional and multi-dimensional array, subscripted variables
2. Functions in C

### SECTION-B

**Computer Programming using C**

**Unit-IV:**

1. Matrix operations such as:
    a. Addition and subtraction
    b. Multiplication
    c. Transpose
    d. Testing summary etc.
2. Fourth order, Runge - Kutta method for solution of first order, second order differential equations and two simultaneous equations.

**Unit-V:**

1. Solution of quadratic equation
2. Numerical integral using Trapezoidal and Simpson rule
3. Finding root of equation f (x) = 0 by Newton –Raphson , Regula -Falsi and Bisection method.

**Unit VI:**

1. Centre of gravity, moment of inertia & radius of gyration of Tee section.
2. Bending moment and shear force ordinates for simply supported beam subjected to point and uniformly distributed load only.
3. Design of singly reinforced beam by limit state method.
4. Determination of coefficient of permeability in parallel and perpendicular direction of bedding plane
5. Reduce level by height of instrument method.
6. Determination of Chezy's constant.

**BOOKS RECOMMENDED:**

1.E Balagurusamy, Programming in ANSI C
2.Yashavant P. Kanetkar, Let Us C
3. Pradeep Dey & Manas Ghosh "Computer Fundamentals &Programming in C" Oxford University Press 2006.
4. Herbert Schildt - C Complete Reference (Tata-McGraw Hill)
5. Gottfried – Problem Solving in C (Schaum Outline Series- McGrawHill)
6. Noel Kalicharan - C by Example (Cambridge University Press)

**(Professional Elective I )**

## 5CE04 : ( I ) Highway Construction and Management

**Learning Objectives of Subject:**

- To know the development of transport, various road development plans and policies in India and test procedures for highway materials.
- To understand the principles of highway geometric design as per IRC standards.
- To study the different types of pavement its construction, maintenance & design by different methods.
- To understand the Traffic engineering & different types of traffic control devices.
- To study the causes, preventions, better planning & design of highway to prevent accidents.
- To study various types of equipments, their working principles & limitations for flexible and rigid pavement.

**Course outcomes:**

At the end of the subject the students will be able –

- Explain the basic concepts about highway engineering
- To design geometric elements of the highway.
- To design the various types of road pavements with construction and maintenance of highway.
- To carry out traffic studies and implement traffic regulation and control measures and intersection design.
- To apply the knowledge to prevent the road accidents.

### SECTION A

**Unit I:** Highway: Development and Planning, Road Transport characteristics, classification of Roads, Road development plans & Salient features, Road pattern, Alignment principles, Egg. Survey for highway. Material and Testing. Various properties of aggregates and bituminous materials and Test, IRC, IS Specifications, bituminous mix design.

**Unit II:** Geometric Design : cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEV Theory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, super elevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.

**Unit III:** Pavement Design: Components of Flexible and Rigid pavement, Design factors, ESWL, Flexible pavement design by C.B.R. Method. Westergards analysis for wheel load & Temperature stresses in rigid pavement, Rigid pavement by IRC method (As per IRC-37), Combination of stresses, Joints in Rigid Pavement, Construction And Maintenance – WBM Surface dressing, Bituminous roads, cement concrete Pavement, construction procedure, construction of roads in expansive soil .

## SECTION B

**Unit IV:** Traffic Control Devices: Traffic signs, markings, islands and signals. Different methods of signal design; redesign of existing signal including case studies. Signal system and co-ordination. Evaluation and design of road lighting.

**Unit V:** Road Safety: Road accidents, Causes, scientific investigations and data collection. Safety in Road Design – Accident prevention through better planning and design of roads – planning road networks by land use planning. Traffic calming techniques and innovative ideas in road safety.

**Unit VI:** Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

**Books Recommended:**

1. Kadiyali L.R., " Principles & Practice of Highway Engineering" Khanna Publisher
2. "Highway Engineering", Khanna & Justo, (Nem Chand & Poros, Roorkee.1997)
3. E.J. Yoder, "Principles of Pavement Design," John Wiley & Sons lnc., New York
4. Chakroborty P Das "Principles & Practice of Highway Engineering" (Khanna Publisher 2000)

**REFERENCE BOOKS:**

1. Highway Material Testing – S K Khanna- C.E.G. Justo, Nemchand Bros- Rookee, 2000
2. S.K.Khanna & Justo C.E.G., Highway Material Testing Manual
3. A.K. Duggal and Vijay P.Puri, "Laboratory Manual in Highway Engineering,"

## 5CE04: ( ii ) Repairs & Rehabilitation Of Structures

**Learning Objectives of Subject:**

- To learn various distress and damages to concrete and masonry structures
- To understand the importance of maintenance of structures
- To study the various types and properties of repair materials
- To assess the damage to structures using various tests
- To learn the importance and methods of substrate preparation
- To learn various repair techniques of damaged structures, corroded structures

**Course outcomes**

By the end of this course students will have the capability/knowledge of

- Various distress and damages to concrete and masonry structures
- The importance of maintenance of structures, types and properties of repair materials etc
- Assessing damage to structures and various repair techniques

### SECTION A

**Unit I :**Introduction: General Consideration, Distresses monitoring, Causes of distresses, Quality assurance, Defects due to climate, chemicals, wear and erosion, inspection, Structural appraisal, Economic appraisal Structural Health, factors affecting health of structures, effect of leakage, age, creep, corrosion, fatigue on life of structure.

**Unit II:** Structural health monitoring, various measures, regular maintenance, structural safety in alteration. Quality control & assurance of materials of structure, durability of concrete, Factors affecting durability of concrete, Corrosion in structures, Testing and prevention of corrosion, fire safety.

**Unit III :** Structural Audit, Assessment of health of structure, study of structural drawings, nature of distress, visual observations, Collapse and investigation, limitations of investigator, tools for investigation, Various NDT Methods for assessing strength of distressed materials, investigation management, review of assimilated information, interviews and statements, evaluation and reporting, presentation of report, communication gap among client, architect, consulting engineer & contractor.

### SECTION B

**Unit IV:** Retrofitting of Structures, parameters for assessment of restoration strategies, selection of construction chemicals during restoration, Specification for important items of work in restoration, Structural detailing for restoration, and various techniques of retrofitting. Waterproofing of RCC water retaining structures.

**Unit V:** Safety during construction, formwork and staging, material handling, Existing methods of formwork, Modular formwork, Structural aspects for formwork in buildings & bridges.

**Unit VI:** Demolition of Structure, study of structural system and structural drawings, need and importance for demolition, outline of various demolition methods and their evaluation, partial and controlled demolition, role of safety measures, temporary support structures in demolition. Recycling of demolished materials

**Books Recommended:**


1. Deananmmer: 'Handbook of Material Management'; McGraw Hills.
2. Gopalkrishnan: 'Fundamentals of Material Management'; Tata McGraw Hills.
3. M Y Khan and Jain: 'Financial Management'; Tata McGraw Hills
4. A M Neville: 'Properties of Concrete'; Longman
5. R N. Raikar: 'Durable Structures', R & D Centre, (SDCPL), RaikarBhavan, Sector 17, Vashi, Navi Mumbai.
6. R.N. Raikar: 'Learning from Failures', R & D Centre, (SDCPL), RaikarBhavan, Sector 17, Vashi, Navi Mumbai.
7. R.N. Raikar: 'Diagnosis and treatment of structures in Distress', R & D Centre, (SDCPL), RaikarBhavan, Sector 17, Vashi, Navi Mumbai.
8. Hanbook on Seismic Retrofit of building , Central public works Department & Indian Building Congress In Association with IIT - Madras

## 5CE04 : (iii ) Sustainable Construction Methods

## SECTION A

**Learning Objectives of Subject:**

- Student should learn about the present demand supply gap of various construction resources and resource forecasting.
- Student should be able to understand various pollutions and its impact, rules and regulation related to pollution control.
- Student should be able to understand the concept of Sustainability , strategy to achieve it .
- Student should turn aware about various organizations working for implementing sustainability , Green rating agency and process to achieve it.
- Student should be able to determine use of waste material by proper process and percentage.
- Student should learn about sustainable construction like – Green roofs, Green walls etc.
- Student should be able to understand thermo resistive property of construction material and its effect on utilization.
- Student should learn about sustainable Illumination , ventilation techniques .
- Student should know to manage domestic water resources.

**Course outcomes:**

**At the end of the subject the students will be able -**

- To understand present condition and need for replacement of non renewable resources.
- To understand concept of sustainability and strategy to achieve it.
- To understand various criteria's and considerations to achieve sustainable construction according to Green Rating Agencies.
- To decide application of sustainable methods in construction for Roof, Wall, thermo resistivity etc.
- To reduce water need and reuse of house hold waste water.

### Section A

**Unit I:** Role of Construction sector in Global Resource Consumption, Resource like sand , water , aggregates , cement etc. demand supply gap analysis. Construction & Demolition waste. Environmental pollution related terms like Global warming, Carbon credit, Resource exploitation, Land pollution, Urban Heat Island, Air and water Pollution. Rules and Act related to waste management and pollution mitigation.

**Unit II:** Concept of Sustainability, Its origin, Legislation related to Sustainable construction , Reduce –Reuse – Recycle ( 3 R ) Strategy , Various Green Rating Agency worldwide, Detail study of criteria's and process under GRIHA (Green Rating for Integrated Habitat Assessment), IGBC (Indian Green Building Council), LEED, India (Leadership in Energy and Environmental Design).

**Unit III:** Concept of Manufacturing cost, operational cost and life time cost, Payback Period. Thermo resistive property of construction materials and its importance. Implementation of Waste and recycled materials in construction – Case study of some projects like Use of Plastic in Road construction, recycled aggregate utilization and similar to this. Various types of Renewable Energy and its application.

## SECTION B

**Unit IV:** Concept of Green/ Sustainable Roofs, Its types, geometry, material, methodology and Limitations. Concept, material & methodology and limitation of Green walls, various methods like implementation of Cavity wall, Rattrap bond wall, thermo resistive material wall, Green vegetative wall etc.

**Unit V:** Sick Room, Need and types of windows & ventilations, active and passive ventilation concept, Role of opening location and dimension in Ventilation and air circulation. Sustainable ventilation techniques.

**Unit VI:** Illumination terms :- Glare , Glare Index ,dark room, comfortable illumination , Lux value for various rooms as per utilization as in latest Building Code of India , Role of Solar direction, season and location for direction and provision of openings. Sustainable Illumination Techniques (Natural & Artificial methods) ,
Water Management – Re Use of domestic water, Grey water – Concept and some Grey water treatment units example, Ground water recharging techniques, Rain water harvesting.

**Books Recommended:**

1. Moore F: Environmental Control System McGraw Hill, Inc., 1994.
2. K S Jagadish, B V Venkataramana Reddy, K. S. NanjundaRao : Alternative Buildings Materials and Technologies, New Age International Publishers, New Delhi, 2007
3. "Construction Materials, Methods & techniques" (3e) by William P Spence, Yesdee Publication 2012, pvt.ltd, Chennai, India
4. "Concrete Structure Properties & Materials" by mehataP.K&MantreioP.J.M, Prentice hall.
5. "Building Materials" ny M. L. Gambhir, NeaJamwal, Tata McGraw Hill Publication.
6.Building Reuse ,Sustainability preservation and value of life by Kathrin Rogers Mrilino.
7. Sustainable Construction Engineering & Management by Dr. S.K.Deshmukh & Dr. Abhinandan R.Gupta, LAP academic Publishing Mauritius
8. Energy Efficient Construction Materials, Key Engineering Material, Elsevier by Dr. S.K. Deshmukh & Dr. Abhinandan R.Gupta
9.Handbook of GRIHA for Green Rating
10.Handbook of LEED , India for Green Rating.

## 5CE04 : (iv) Watershed Engineering And Management

**Course Objective:**

- To study the different hydrological parameters.
- To understand hydrological statistics and design.
- To characterize and mitigate natural and man-made hazards

**Course Outcome**: Student shall be able to

- Explain the hydrology and hydrological data.
- Analyze the hydrological methods for runoff.
- Evaluate the ground water hydrological problems.

### SECTION - A

**UNIT I:** Introduction: Watershed, Definitions, Concept of watershed development, objectives of watershed development, and need for watershed development, Integrated and multidisciplinary approach for watershed management.

**UNIT-II:** Characteristics of Watersheds: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

**UNIT-III**: Hydrology in water resources development, statistical analysis of rainfall and runoff, different distributions methods, Estimation of Unit Hydrograph-flood flow formulae, Storm hydrograph, Storage and regulation of runoff-safe yield of streams

### SECTION - B

**UNIT-IV:** Hydrology of ground water : Common aquifers-Exploration for ground water, hydraulics of ground water flow- Measurement of permeability of formations, flow nets and their constructions, Boundary conditions – Unconfined and Confined, steady and unsteady flow into wells, Method of images – Types, design, construction and maintenance of wells and infiltration galleries, Development of wells – well strainer – functions and selections, Ground water recharge

**UNIT-V:** Practice of watershed management: rehabilitation, protection and enhancement, non-point sources of pollution: the legal basis, the process of non point source pollution control, best management practices principles, Applications of Geographical Information System and Remote Sensing in Watershed Management

**UNIT-VI:** Storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation. Drought assessment and classification, drought analysis techniques, drought mitigation planning. Water conservation by recycle and reuse

**Books Recommended:**

1. Watershed Hydrology by Peter E. Black.
2. Water Resources Systems, Planning and Management by R. N. Chaturvedi.

**(Open Elective)**

**5CE05 : (i) Basics of Building Construction**

**Learning Objectives of Subject:**

- To understand the basic concepts of structures and types of foundation of civil structure.
- To learn about the different type of masonry, types of bonds and construction methodology.
- To understand various levels in building – Types of floorings and floors,
- To understand the type and need of openings for access and circulation.
- To make aware of knowledge and importance of stairs, plastering and painting of structures.
- To understand the aspects of construction.

**Course outcomes:**

**At the end of the subject the students will be able -**

- To understand Load bearing and Frame structure with their foundations.
- To recognize various types of construction material and its suitability
- To recognize the various levels in building and its need.
- To know types of openings, doors, windows and other related fixtures.
- To recognize types of rock and minerals and its construction properties.
- To understand the basic concepts of DPC, fireproof, soundproof and expansion joints in structure.

**SECTION –A**

**Unit I:** Introduction: Definition of building as per national building code, components of buildings and their function , Types of structure-load bearing structure and frame structures, their relative advantages and disadvantages, load bearing walls and partition walls. Types of foundation- Definition and necessity and types of foundations, precautions to be taken against failure of foundations

**Unit II:** Stone Masonry- Technical term, general principles to be observed during construction, selection of stone masonry. Brick Masonry Construction- Technical term, general principles to be observed during construction, commonly used types of bonds such as Stretcher, Header, English bond Flemish bond and their suitability.

**Unit III:** Floors- Types of floors-Basement floor, ground floor and upper floor. Types of upper floors-R.C.C. slab floor, R.C.C. slab and beam floor, R.C.C. grid floor, R.C.C. flat slab floor. Floor Finishes Types of flooring material, Shahabad , Kota, Granite, Ceramic tiles, Plain tiles, mosaic tiles glazed tiles ,different types of floor finishes , their suitability. Method of

construction, criteria of selection. Roofs-Flat and pitched roof, steel roof trusses-types and suitability ,fixing details at supports ,types of roof covering, AC and GI sheets, acrylic sheets, fixing details of roof covering.

## SECTION –B

**Unit IV:** Door –Purpose, criteria for location, size of door, door frames and its types, method of fixing Windows- Purpose, criteria for location, size and shapes of windows, types of windows and their suitability. Ventilators – Types and their suitability. Fixtures and Fastening for doors and windows. Glass- Types of glass and their suitability. Arches and Lintels - Types and their suitability. Details of R.C.C. lintels and chajja, precast lintels and arches

**Unit V:** Stairs- Function, technical terms, criteria for location, types of staircases and their suitability. Painting and Coloring – Necessity, types, processes of painting and coloring to the wall surface, wooden surfaces, iron and steel surfaces, types of paints and their uses Scaffolding-Purposes, types, suitability.

**Unit VI:** Special Aspects of Construction, Damp proofing-causes of dampness, its effects, various methods of damp proofing, material used for damp proofing. Fire proof construction-Points to be observed during planning and construction. Fire protection requirement for a multistoried building, Sound proof construction –Sound absorbents and their characteristic. Joints Expansion and construction joints necessity, details of expansion joint at foundation level and roof level of load bearing structure and framed structure, Provision of construction joints in slabs, beams and columns.

**Books Recommended:**

1. DeshpandeR.S... And Vartak C.V.: A Treatise on Building Construction.
2. Sharma S.K. Kaul and B.K.:A.T.B. Building Construction, S Chand and co.
3. Sane L.S.: Construction Engineering, ManakTalas, Mumbai
4. Chudley R.: Construction Technology, Volume I.II.III. And IV, Longmans Group Ltd.
5. Basics of Civil Engineering, Vol. I by Dr A.R.Gupta , Google book publishers ltd.
6. Gurucharan Sing: Building Construction Engineering, Standard Book House, Delhi-06
7. Sushilkumar :Building construction ,Standard publisher distributors.
8. B.C.Punmia ,A.K. Jain,: Building construction.

ISE National Building code of India, 1970

## 5CE05 : (ii) Disaster Management

**Learning Objectives of Subject:**

- Student should learn about the term Disaster and definitions associated with it.
- Student should know various types , reasons for happening and preventive measures for Natural Disasters .
- Student should know various types , reasons for happening and preventive measures for Artificial Disasters .
- Student should know about Impact and mitigation measures against disasters.
- Student should know about Disaster Risk Reduction and its utility practices.
- Learner should know about various Government and NG organization working for Disaster Management.
- Student should know role and responsibility of individual and group for managing Disaster.

**Course outcomes:**

**At the end of the subject the students will be able -**

- To understand concept and terms related to Disaster.
- To understand various types of Natural and Artificial Disaster .
- To decide and take actions to mitigate impact of disaster.
- To know roles and responsibility of organizations – public and private , individual and group to manage disaster.

### SECTION A

**Unit I:** Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation. Study about natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.);

**Unit II:** Study about manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

**Unit III**: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

### SECTION B

**Unit IV:** Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures, vulnerability and capacity assessment; early warning systems, Post disaster environmental response

**Unit V:** Institutional mechanism for Disaster Management**,** Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, Disaster Management Policy Environment and local Action, Funding for Disaster Management, Capacity Building, Disaster Management Act 2005.

**Unit VI:**. Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster, plan to counter, threats to water supply.

**Books Recommended:**


1. Cuny, Fred C; Disasters and management, oxford Uni. Press.
2. Alexander, David; Principles of emergency planning and management, Terra publishing, ISBN 1-903544-10-
3. National Disaster Management Authority, Govt. of India, Report.
4. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994


## 5CE05 : (iii) Soft Skills and Interpersonal Communication

**Learning Objectives of Subject:**

- Student should learn about the methods and measures to develop the interaction skills.
- Student should be able to have strong decision making and lateral thinking skills.
- Should know the do's and don'ts for being good leader.
- Should be able to understand about conflict and be able to manage it.
- Should understand need of Negotiation and strategy to handle it wisely.
- Should be able to recognize the type, ways and barriers in Communication so as to develop it.
- Should be able to conduct effective correspondence process and shall have knowledge of documentation and formal writing skills.

**Course outcomes:**

**At the end of the subject the students will be able -**

- Interact in developed way so as to handle the situations .
- To take analyzed decisions over the problem and will effectively carry out wok in time.
- To handle task with developed leadership skills.
- To determine the reasons and solutions over conflict and will be able to manage it.
- To understand need for negotiation and strategy negotiate things.
- To have strong communication.
- To carry out formal documentation process and will have proper guideline for writing formal basic documents.

## Section A

**Unit I** : Individual's Basic Interaction Skills –Within family, Society Personal and interpersonal intrapersonal skills . Types of skills; conceptual, supervisory, technical, managerial and decision making skills. Problem Solving, Lateral Thinking. Self Awareness and Self Esteem Group Influence on Interaction Skills Human relations examples through role – play and cases.

**Unit II** : Leadership Skills Working individually and in a team Leadership skills Leadership Lessons through Literature Team work & Team building . Interpersonal skills – Conversation, Feedback, Feed forward Interpersonal skills – Delegation, Humor, Trust, Expectations, Values, Status, Compatibility and their role in building team – work. Conflict Management – Types of conflicts, how to cope with them Small cases including role – plays will be used as teaching methodology.

**Unit III** : Negotiation Skills (To be Taught through Role Plays and Cases) Types of Negotiation Negotiation Strategies Selling skills – Selling to customers Selling to Superiors Selling to peer groups, team mates & subordinates Conceptual selling, Strategic selling Selling skills – Body language

## Section B

**Unit IV** : Introduction, Need for Communication, Process of Communication - Written and Verbal Communication, Visual communication, Signs, Signals and Symbols, Silence as a Mode of Communication - Inter-cultural, Intra-cultural, Cross-cultural and International communication - Communications skills, Communication through Questionnaires, Business Letter Writing, Electronic Communication.

**Unit V** : Barriers to Communication Improving Communication Skills -Preparation of Promotional Material -Non-verbal communication -Body language -Postures and gestures -Value of time -Organizational body language - Importance of Listening -Emotional Intelligence.

**Unit VI** : -Business Cases and Presentations, Letters within the Organizations, Letters from Top Management, Circulars and Memos - Business Presentations to Customers and other stakeholders, Presenting a Positive Image through Verbal and Non-verbal Cues, Preparing and Delivering the Presentations, Use of Audio-visual Aids .

**Book Recommended**

1. Personality Development & Soft Skills by Barun K. Mitra.
2. Soft Skills and Interpersonal Communication by S. Blasubhramanium.

### 5CE06 : Design Of Reinforced & Prestressed Concrete Structures - Lab

**Practical's:**

1. Candidates are required to prepare at least two designs based on theoretical course detailed working drawings are necessary.
2. A journal/report on design shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.
3. Field visit on any RCC framed structure & report of the same.

### 5CE07: Surveying & Geomatics – Lab

Following is the list of practical to be conducted. Minimum 8 practical out of the given should be carried out. Practical examination shall consist of field exercise and viva-voce examination based on theory&practical.

## LIST OF PRACTICALS: (ANY EIGHT)

1. Ranging circular curve by offset from long chord.
2. Ranging circular curve by offset from tangent.
3. Ranging circular curve by offset from chord produced.
4. Ranging circular curve by Rankine's method.
5. Triangulation by satellite station.
6. Base line measurement in triangulation system.
7. To Find horizontal distance and difference in elevation between two points by using Total station.
8. To plot a layout using Total station.
9. Study on Stereoscope.
10. Application of GPS – Distance and Coordinate Measurement using GPS tool.

### 5CE08 : Numerical Methods And Computer Programming -Lab

**PRACTICALS:**

Preparation and execution of at least **six** computer programs using C language. Solution of at least **two** civil engineering problems using spreadsheet software. A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

## 5CE09: Highway Construction and Management -Lab

**List of Practical's :-**

Any **Five** of the following should be conducted and a report there of should be submitted

1. Field CBR Test.
2. Pavement Evaluation by Benkelman Beam Method.
3. Road Unevenness Measurement by Bump-Integrator.
4. Valuation of Pavement Roughness by Roughometer / Profilometer.
5. Design of Flexible Pavements for Highway.
6. Design of Flexible Pavements for Runway.
7. Design of Rigid Pavements For Highway.
8 Design of Rigid Pavements For Runway
9. Design of Overlays.
10. Marshal Stability Test
11. Transportation management (**field studies)**
12. Parking management (**field studies)**
13. Road accident studies (**field studies)**
14. Rotary design

**Field Visit:**

1. Hot – mix plant visit,
2. Road construction site visit: Earth work construction procedure and bituminous mix laying, spreading and rolling procedure.

## 5CE09 : Repairs & Rehabilitation Of Structures - Lab

**List of Experiments: (Any Three)**

1. To perform a non-destructive and semi-destructive testing on the cast specimens of the beams using set up of Rebound hammer, UPSV, Core drilling etc. and there by prepare a report on the interpretation of the strength i.e quality of concrete based on NDT test results.
2. Take up Conditional Assessment of 5 different structures including Residential, Commercial, Industrial, and Government buildings, Private structures (old & new construction both). Prepare Rapid visual inspection data sheets of the same.
3. Prepare a report of the buildings surveyed, to highlight all the defects/deterioration seen through proper resolution photographs. The report must clearly indicate the distress – its source and symptoms.
4. Perform experiment to evaluate the Compatibility between the substrate material concrete and any repair material. (For instance comparing the Bond strength of Polymer modified mortar and Conventional Mortar with Concrete).

5. Experimental investigation to carry out the efficacy of repair material/ technique of enhancing the strength of concrete beam post cracking. (For instance, Cast a RCC beam, simulate cracking and then filling the crack with repair material and check the post-repair strength results).

Major Equipment: Compression Testing Machine, Concrete Mixture, NDT equipment like USPV, Rebound Hammer, Corrosion Meter, Rebar Locator, Engineer's inspection Kit.

**5CE09 : Sustainable Construction Methods – Lab**

1. Experimentation to check the corresponding strength of material by mixing waste material for Concrete work : Casting of 2 sets of specimen only with each set of 3 cubes , for percentage replacement of concrete elements with any suitable waste material like – Recycled aggregate, waste vehicle tire etc.
2. Experimentation to check the corresponding strength of material by mixing waste material for Brick work : Study of cavity wall and rattrap wall for thermo resistive property.
3. Student can work out and prepare report on installation plan , process ,budget, payback period and maintenance required for renewable energy source like solar / wind for small residential house of around 5 rooms.
4. Study and Preparation of Isolux mapping for room using Lux meter, for understanding illumination area and pattern.
5. Case Study : Students should visit to nearby sustainable construction like old existing monumental structure like Palace, religious place, well , fort **or** any Green rated structure by valid Rating agency like GRIHA , LEED India etc. **or** any undergoing sustainable project in vicinity for better understanding and needs to prepare the short report over learning's.

**5CE09** : **Watershed Engineering And Management – Lab**

Minimum 8 practical's out of the given should be performed. The Site visit is compulsory. The Graphs and sheets are to be drawn whenever are necessary. The practical examination shall consist of viva-voce based on theory and Practical.

**List of Experiment**

1. Study of watershed management technologies.
2. Watershed planning and development.
3. Surveying and preparation of watershed map.
4. Analysis of hydrologic data for planning of watershed development.
5. Water budgeting of watersheds.
6. Grid survey of watershed area.
7. Study of Aquifer (Working, Types, Flow net)
8. Study of infiltration galleries. (Types, Design, Construction, Maintenance)
9. Study of unit hydrograph, Storm hydrograph
10. Design of storm water drainage system.
11. Visit to watershed development project

## Sixth Semester

## 6CE01: Design of Steel Structure

**Learning Objectives of Subject:**

- To introduce steel structures and its basic components
- To understand methods of design of steel structure.
- To introduce structural steel fasteners like welding and bolting
- To introduce design method of tension & compression members.
- To introduce design method of beams, Column, Base Plate.
- To introduce design load on a typical steel roof trusses.

**Course outcomes:**

At the end of the subject the students will be able -

- To explain the methods of design of steel structure.
- To design bolted and welded connection.
- To identify the different failure modes of bolted and welded connections, and determine their design strengths.
- To design the Tension and compression member.
- To identify and compute the design loads on a typical steel roof trusses.
- To design basic elements of steel structure like beams, column and bases.

**(By Limit State Method IS 800:2007)**

**SECTION – A**

**Unit I:**

- Introduction to WSM, LSM & Plastic analysis of steel structure, plastic hinge, plastic moment capacity, shape factor, plastic section modulus.
- Design of bolted & welded connections subjected to axial and eccentric loading (In the plane of group of Bolts & Weld).

**Unit II:**

- Design of Compression & Tension member.
- Design of Industrial shed.

**SECTION – B**

**Unit III:**

- Design of simple & compound columns for axial loading.
- Design of column bases (Slab base & Gusseted base) subjected to axial load.

**Unit IV:**

- Design of simple Beams (laterally supported).
- Design of compound Beams (laterally supported).

**Books Recommended:**

1. Duggal, S. K., Design of Steel Structures, Tata McGraw Hill Pub. Company Ltd.
2. N. Subrramanyam, Design of Steel Structures, Oxford University Press, 2008.
3. V L Shah & Veena Gore: Limit State Design of steel structures IS 800-2007
4. M. R. Shiyekar, Limit state design in Structural Steel (Second Edition); PHI Learning Pvt. Ltd.
5. Bhavikatti, Design of Steel Structures: By Limit State Method as Per IS: 800 – 2007; I K International Publishing House Pvt. Ltd
6. M. L. Gambhir, Fundamentals of Structural Steel Design ; McGraw Hill Education

## 6CE02: Environmental Engineering – I

**Course Objectives: -**

- To make the students conversant with sources and its demand of water
- To understand the basic characteristics of water and its determination
- To expose the students to understand the design of water supply lines
- To provide adequate knowledge about the water treatment processes and its design
- To have adequate knowledge on operation and maintenance of water supply

**Course Outcomes: -**

- Define and explain the significance of terms and parameters frequently used in water supply engineering.
- Evaluate the influence of the different parameter in design and treatment of water treatment plant (water quality parameters).
- Basic methodology for water treatment (viz., sedimentation, coagulation, flocculation, filtration, disinfection and water softening.)
- An understanding of water quality criteria and standards, and their relation to public health.

### SECTION – A

**Unit-I :** Quantity Estimation of water: Demand of water. Consumption for various purposes. Fire Demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population.
Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection.

**Unit-II** :Water quality: Impurities in water, their effects and significance water borne diseases, collection of water samples. Water analysis- physical, chemical and bacteriological. Water quality standards: I.S. & WHO, Flow diagrams and layouts of different water treatment works. Intakes- type, location, requirement & features.

**Unit-III:** Aeration: Purpose, types of gravity aerators & spray aerators.
Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, Flocculation, clarrifloculator. Design criteria for sedimentation tanks, surface loading, simple problems on design of sedimentation tanks.

## SECTION – B

**Unit-IV:** Filtration: - Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process. Control system, Negative head, operating difficulties, pressure filter; Simple design problems on rapid sand filters.

**Unit V**:Disinfection: - Requirement of good disinfectant, methods of disinfection. Chlorination: Methods, prechlorination, post chlorination. Break point chlorination and super chlorination, forms of chlorine. Use of bleaching powder - Simple problems. Introduction to tertiary treatments-Softening and Defloridation.

**Unit-VI:** Distribution system: - Types of supply: Continuous, and intermittent. Types of system: Gravity, Pumping and combined gravity and pumping, Layouts of distributions system. Maintenance of distribution system. Equalizing storage, Type of storage reservoirs, capacity. Types of conduits, joints, appurtenances. Pipe laying and testing.

**Books Recommended:**

1. Steel E. W., “Water Supply and Sewerage”, Mc-Graw Hill.
2. Kshirsagar S. R., “Water Supply Engineering”, Roorkee Pub house, Roorkee.
3. Birde G. S. , “Water Supply and Sanitary Engineering”, Dhanpat Rai and Sons, Delhi.
4. Punmia B. C. “water Supply Engineering”. Laxmi publication.
5. Garg S.K. Water Supply Engineering, Khanna Publishers.

## 6CE03: Fluid Mechanics

**Course Objective:**

1. To study the basic behavior of fluids and fluid system and the laws governing this behavior
2. To understand and apply the basic concepts Mechanics to carry out professional engineering activities in the field of fluids.
3. To apply scientific strategies to analyze qualitatively and quantitatively the problems and give solutions.

**Course Outcome** : Student shall be able to

1. Describe basic properties of fluid flow.
2. Apply the knowledge to fluid flow problems.
3. Analyze the type of flow by using basic of mathematical principle.
4. Solve and modeling the pipe flow problems.

### SECTION - A

**Unit I:** Properties of fluids: Introduction, properties of fluids, viscosity, surface tension, & capillarity, related problems.

Pressure and its measurement: Fluid pressure at a point, Pascal's Law, pressure variation in a fluid at rest, absolute gauge, atmospheric & vacuum pressures, measurement of pressure, simple manometers, differential manometers, related problems.

**Unit II:** Hydrostatic forces on surfaces: Introduction, total pressure & centre of pressure, vertical, horizontal plane surface submerged in liquid, related problems.

Buoyancy & floatation**:** Introduction, buoyancy, centre of buoyancy, metacentre, metacentric height, analytical method of metacentric height, conditions of equilibrium of a floating & submerged bodies, related problems.

**Unit III:** Kinematics of flow :Introduction, methods of describing fluid motion, types of fluid flows, continuity equation in three dimensions, velocity & acceleration, velocity potential function & stream function, related problems.

Dynamics of fluid flow: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, its assumptions, related problems.

## SECTION - B

Unit IV: Measurement of fluid flow, Horizontal venturimeter, V and Rectangular Notches, Darcy's equation (no proof), major and minor losses in pipes, pipes in series and parallel, pipe network. Momentum equation and its application to horizontal pipe bends.

**Unit V:** Dimensional Analysis; Buckingham's Pie theorem, it's application, similitude, Dimensionless numbers, Re, Fr, We, Predominant forces & their ratio, Model Analysis - Geometrically similar models, Reynolds law, Froudes law, Model study of spillways.

**Unit VI:** Uniform flow, Open channel flow, Types of flow, geometric elements of rectangular & trapezoidal sections, Chezy's &Mannings equations, most efficient rectangular & trapezoidal section, Energy & momentum principles, Normal & critical depth, specific energy diagram, discharge diagram.

**Books Recommended:**

1) Modi P.N. & Seth S.M.: Hydraulics & Fluid Mechanics, SI Edition, Standard book house.
2) Dr. Jain A.K.: Fluid Mechanics, Khanna publication.
3) Subramanya K.: Fluid Mechanics, Tata Mc-Graw Hill.
4) Streeter: Fluid Mechanics, Mc-Graw Hill.
5) Fluid mechanics by R.K.Bansal, Laxmi publication.
6) Garde&Mirajgaonkar: Fluid Mechanics, Scitech publication.

## Professional Elective - II
## 6CE04: (i) Advanced Construction Materials

**Learning Objectives of Subject:**

- To understand the special type of concrete and supplementary cementitious materials.
- To learn about the different type of metals and new alloy steels.
- To learn different composite materials and Thermal and Sound insulating materials.
- To understand different types of construction chemicals and wastes.
- To learn different types of shoring and formwork materials.
- To understand the concept of smart materials.

**Course outcomes:**

**At the end of the subject the students will be able -**

- To understand special type of concrete and supplementary cementitious materials.
- To recognize various types of metals and new alloy steels.
- To understand Thermal and Sound insulating materials.
- To know types of construction chemicals and wastes.
- To recognize types of shoring and formwork materials.
- To understand the elementary concept of smart materials.

### Section A

**UNIT I: Cement, Mortar And Concrete Ceramic Materials**

Study of Special Purpose Cement, Mortar, Concrete - High Strength And High Performance Concrete, Self Compacting Concrete, supplementary cementitious material - Fly Ash, Red Mud, Gypsum, Various Types of Finishes & Treatments, Engineering Grouts, Mortar plaster, Gypsum, Glass. GGBS, micro silica etc. Replacement of aggregates; stone dust, light weight aggregates, recycled aggregate.

**UNIT II: Metals**

Steels - HYSD, TMT, Tendons, Light Gauge Steel, Steel Fastenings, New Alloy Steels – Aluminum and Its Products, Protective Coatings to Reinforcement.

**UNIT III: Composites**

Polymer and its composites , Ceramic and its composite, FRC, Ferro cement etc.,Timber, bamboo, veneer, Laminates, Particle boards,Thermal and Sound insulating materials.

## Section B

**UNIT IV: Construction Chemicals And Waste**

Chemical Admixtures and Adhesives, Water Proofing Compounds – Non Weathering Materials, GeoSynthetics, Geo-Membranes,, Asphalt, Tar & Bituminous Materials, Agro Waste Materials, Industrial Waste Materials, Disposable Materials.

**UNIT V: Shoring & Formwork Materials**

Materials, Accessories and Proprietary Products - Lumber - Types - Finish - Plywood -Types and grades, Reconstituted wood -Steel -Aluminum Form lining materials, Design Considerations, Building and Erecting the formwork, Causes of Failure of Formwork.

**UNIT VI: Elementary Concept Of Smart Material**

Smart and Intelligent Materials-Piezoelectric Materials, Shape Memory Alloys & Polymers, Magnetostrictive Materials, Temperature Responsive Polymer, Halo chromic Materials, Smart Hydrogels, Chromomeric Systems, Photomechanical Materials, Self Healing Materials, Dielectric Elastomers. Bio cement, Phase change material.

**Text Book:**

1. Building Materials, P.C. Varghese, Prentice-Hall India, 2555.

**Reference Books:**

1. Materials Science and Engineering: An introduction, W.D. Callister, John Wiley, 1994.
2. Materials Science and Engineering, V. Raghavan, Prentice Hall, 1990.
3. Properties of Engineering Materials, R.A. Higgins, Industrial Press, 1994.
4. Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press, 2551.
5. The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess, R.J. Gray & A. Bentur, Prentice Hall, 1998.
6. Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann, 2553.
7. The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin, 1995.
8. Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill, 2556.
9. Properties of concrete, A.M. Neville, Pearson, 2554.
10.Materials for Civil and Construction engineers by Michael S. Mamlouk, John P. Zaniewski, Pearson Publication

## 6CE04 : (ii) Geographic Information System & Science

**Course Objectives:**

- To prepare the student to understand remote sensing, it's techniques and interpretations.
- To introduce the concepts of image processing and basic analytical methods to be used in image processing
- To familiarize students with image enhancement, restoration techniques, and to understand different image compression techniques.
- To gain a basic, practical understanding of GIS concepts, techniques and real-world applications

**Course Outcomes:**

Students will be able to

- Explain and communicate quantitative remote-sensing principles and integrate different tools for remote sensing data analysis
- Perform image corrections, enhancements and generate high-level remote sensing products.
- Apply basic graphic and data visualization concepts such as colour theory, symbolization, and use of white space.
- Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.
- Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.
- Review the fundamental concepts of a digital image processing system.

### SECTION – A

**Unit I:** Definition and scope of remote sensing: electromagnetic energy and its wavelengths. Remote sensing systems, sensors and scanners, resolution of sensors, multi-spectral, thermal and radar scanners, radiometers spectral response curve and spectral signatures.

**Unit II:** Elements of sensing system: Terrestrial, airborne and space borne platforms, Sun-synchronous and geo-stationary satellites, advantages and disadvantages. Various earth Resources satellites, Indian remote sensing program. Remote sensing data products and their types: analogues and digital data formats, Thermal and radar imageries.

**Unit III:** Interpretation techniques: Elements of interpretation and methods, interpretation key, interpretation instruments. Relief displacement, image parallax and vertical exaggeration, Determination and calculation of elevation from RS data

## SECTION - B

**Unit IV:** Digital image processing: image rectification and restoration, image enhancement-contrast manipulations, spatial feature manipulation, multi-image manipulation, image classification supervised and unsupervised classification, accuracy assessments and data merging.

**Unit V:** Applications: Integrated approach of RS and GIS application: Application in Geological Investigations, water resources management, environmental studies, EIA based studies, Land use planning, soil studies and transportation planning. Application in civil engineering projects damns and bridges, site investigations, landslide studies.

**Unit VI:** Geographical Information System: Raster and vector data, concepts and basic characteristics of vectorization, topology generation, attribute data attachment, editing and analysis. Global Positioning System: Introduction to Global Positioning System (GPS) - Fundamental concepts, GPS system elements and signals, Classification of GPS receivers.

**Books Recommended:**

1. Remote sensing Geology: Ravi P Gupta, Springer publication
2. Remote sensing and GIS: Anji Reddy ISBN publication.
3. Remote Sensing: Sabins, Floyd F
4. Higher surveying volume III: Dr. B C Punmia

## 6CE04 : (iii) Masonry Structure

**Course objectives:**

This course will enable students to

- Understand properties of masonry units, strength and factor affecting strength
- Understand design criteria of various types of walls subjected to different loads system
- Impart the culture of following the codes, for strength, serviceability and durability as an ethics.
- Provide knowledge in analysis and design of masonry elements for the success in competitive examination

**Course Outcomes:**

After studying this course student will be able to

- Explain engineering properties and use of masonry units defect and cracks in masonry and its remedial measures
- Summaries various formulas for finding compressive strength of masonry units.
- Explain permissible stress and design criteria as per IS: 1905 and SP-20.
- Design different types of masonry walls for different load considerations.

## Section A

**Unit -1 :- Masonry unit materials, types and masonry construction :** brick, stone and block masonry unit- strain, modulus of elasticity and water absorption of masonry materials, classification and properties of Mortar. Defect and errors in masonry construction- cracks in masonry, types, reason for cracking, methods of avoiding cracks.

**Strength and stability:** strength and stability of axially loaded masonry walls, effects of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of aging, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.

**Unit -II**:-**Permissible stresses:** Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and Lateral load, permissible tensile stress and shear stresses.

**Design consideration:** Effective height of wall and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. problems on design considerations for solid walls, cavity walls, walls with pillar.

**Unit – III : Load consideration and design of Masonry walls subjected to axial loads: -** Design criteria, Design of wall subjected to concentrated axial loads: - Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers,

## Section B

**Unit – IV: Design examples of walls under UDL ,**Solid walls ,cavity walls ,solid walls supported at the end by cross walls, walls with piers .

**Unit – V : Design of wall subjected to eccentric loads: -** Design criteria - stress distribution under eccentric loads -problems on eccentrically loaded solid walls, cavity walls, walls with piers.

**Design of laterally and transversely loaded walls:** Design criteria, design of solid wall under wind loading, design of compound walls.

**Unit –VI: Confined Masonry**

Confined masonry construction, difference between confined masonry and RC frame construction. Earthquake resistance of confined masonry Structures. Earthquake-Resistant Confined Masonry Construction guidelines

**Text Books:**

1. Dayaratnam P, Brick and Reinforced Brick Structures, Scientific International Pvt. Ltd.
2. M. L. Gambhir, Building and Construction Materials, McGraw Hill education Pvt. Ltd.
3 Anand S. Arya, Masonry and Timber Structures Including Earthquake Resistant Design Published by Nem Chand and Bros
4 Svetlana Brzev , Earthquake-Resistant Confined Masonry construction , National Information center of earthquake engineering Indian Institute of technology Kanpur

**Reference Book:**

1.Materials for Civil and Construction engineers by Michael S. Mamlouk, John P. Zaniewski, Pearson Publication

2. Design of Masonry Structures By A.W. Hendry, B.P. Sinha, S.R. Davies

3. Design of Reinforced Masonry Structures, Second Edition, Narendra Taly, McGraw Hill education Pvt. Ltd

## 6CE04 : (iv) Solid And Hazardous Waste Management

**Course Objectives: -**

- To provide an overview of waste generation, waste characterization and waste management processes.
- To impart knowledge on solid waste management with particular emphasis on municipal solid waste management which includes different waste processing options such as pyrolysis, composting, and incineration; designing and operating sanitary landfill.
- To enrich knowledge about characteristics of hazardous wastes and their management.
- To impart knowledge on industry specific solid waste management practices.
- To provide an overview about the concept of land degradation and land reclamation

**Course Outcomes: -**

- An ability to identify and interpret the criteria for the classification of a substance as a solid/hazardous wastes.
- An ability to recognize waste minimization and source reduction, assess and describe the procedure for solid and hazardous waste identification and characterization and various waste processing options.
- Define and elucidate the management, treatment and disposal of hazardous wastes.
- Skill to assess and develop physical/chemical/biological treatment techniques for the control of hazardous wastes.
- Skill to address and describe solid waste management including landfill operation.
- Ability to design and execute land reclamation projects.

### SECTION A

**Unit I**: Municipal solid waste: Definition, Sources and types of solid waste, composition and its determinants of Solid waste-factors influencing generation, quantity assessment of solid wastes, methods of sampling and characterization.

**Unit II:** Collection and Transfer Collection: Collection of Solid waste, collection services , collection system, equipments, time and frequency of collection. Transfer and Transport: Need for transfer operation, transport means and methods, Optimization of Transport Cost.

**Unit III:** Disposal of Solid Wastes Refuse disposal : various methods, incinerations, principle features of an incinerator, site selection and plant layout of an incinerator, sanitary landfill-methods of operation, advantages and disadvantages of sanitary land fill, site selection, reactions accruing in completed landfills, gas and leachate movement and control, equipments necessary, Energy Recovery.

**SECTION B**

**Unit IV:** Introduction: Definition, Need for hazardous waste management, Sources of hazardous wastes, Effects on community, terminology and classification. Storage and collection of hazardous wastes, Problems in developing countries, Protection of public health and the environment.

**Unit V:** Management of hazardous wastes: Identifying a hazardous waste, methods, Quantities of hazardous waste generated, Components of a hazardous waste management plan, Hazardous waste minimization, Disposal practices in Indian Industries, Future challenges.

**Unit VI:** Nuclear wastes and E-waste: Characteristics, Types, Health and environmental effects, Audit of E-Waste. Biomedical and chemical wastes: Biomedical wastes, Types, Management and handling, control of biomedical wastes & Chemical wastes.

**Books Recommended:**

1) George Techobanoglous et al, "Integrated Solid Waste Management" McGraw - Hill, 1993.
2) Techobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.
3) R.E.Landreth and P.A.Rebers," Municipal Solid Wastes-Problems & Solutions". CRC press.
4) J. Glynn Henry and Gary. W. Heinke, "Environmental Science and Engineering", Pearson publication.
5) A. D.Bhide and B.B.Sundaresan, "Solid Waste Management – Collection, Processing and disposal" Mudrashilpa Offset Printers, Nagpur, 2001.
6) Biomedical waste (Management and Handling) Rules, 1998.

## 6CE04 : ( v) Traffic Engineering & Management

**Learning Objectives of Subject:**

1. To understand traffic planning & characteristics for urban roads.
2. To understand different surveys and methods of traffic volume study.
3. To understand the design of different intersections and use visual aids
4. To understand the Traffic safety & control devices to prevent road accidents.
5. To understand the traffic system management.
6. To know advanced technology used in traffic engineering.

**Course outcomes:**

At the end of the subject the students will be able –

1. To explain the road characteristics & traffic planning.
2. To analyze traffic capacity of roads & intersection by different methods.
3. To design different types of road intersections & use of visual aids for roads.
4. To use knowledge of traffics safety & environmental hazards.
5. To recommend suitable traffic management system and traffic regularity measures
6. To apply the knowledge of Intelligent Transportation System to traffic management system.

## Section A

**Unit 1:** Traffic Planning & Characteristics

Road Characteristics – Road User Characteristics – PIEV theory – vehicle – Performance Characteristics – Fundamental of traffic flow – Urban Traffic problems in India – Integrated planning of town, country, regional and all urban infrastructure – towards sustainable approach – Land use & transport and model integration

**Unit 2** : Traffic surveys

Traffic surveys – Speed, Journey time and delay surveys – vehicles volume survey including non-motarized transport – methods and interpretation – origin destination survey – accident analyses methods , interpretation and presentation – statistical applications in traffic studies and traffic forecasting – level of service – concept, application and significance.

**Unit 3** : Traffic design and visual aids

Intersection Design – channelization, Rotary intersection design – signal design – coordination of signals – grade separation – traffic signs including VMS and road markings – significant roles of traffic control personnel – networking pedestrian facilities & cycle tracks.

## Section B

**Unit 4:** Traffic Safety and Environment

Road Accident – Causes, effects, prevention, and cost – street lighting – traffic and environment hazards – air and noise pollution, causes, abatement measures – promotion and integration of public transportation – Promotion of non-motorized transport.

**Unit 5:** Traffic Management

Area Traffic management system – traffic system management (TSM) with IRC standards _ Traffic Regulatory Measures – Travel Demand Management (TDM) – Direct and Indirect Methods - congestion and parking pricing – all segregation methods – coordination among different agencies

**Unit 6** : ITS

Intelligent transport system for traffic management, enforcement and education, Application of ITS to Traffic Management System- Public Transportation Management System

**(Open Elective II)**

**6CE05 : (I )Environmental Management**

**Course Objectives:**

The objective of the course is to provide skills and an improved understanding of how firms and organisations work with sustainability issues such as environmental and natural resource management in order to protect our eco system.

**Course Outcomes:**

**At the end of the course the student will:**

- Be aware of different environmental problems, their causes and effects.
- Have knowledge regarding different environmental policies & management plans.
- Have thorough knowledge about Environmental Legislation and Acts.
- Acquire information about various agencies for Environmental Managements in India.
- Have knowledge regarding different systems working for Environmental Management.

**SECTION – A**

**Unit I:** Different environmental problems - Energy and the environment, Agriculture and the environment, the atmosphere and human activities, etc. Need for environmental management, the nature, scope and components of environmental management.

**Unit II:** Environmental policy analysis- micro level and macro level, methods of policy analysis, steps involved. : Operational methods, quantitative methods, statical analysis public policy analysis resource allocation, environmental economics etc.

**Unit III:** Environmental management plan (EMP): components of Environmental Management Plan, Preparation of Environmental Management Plan.

**SECTION – B**

**Unit IV:** Environmental Legislation and Acts: Water (prevention and control of pollution) Act1974,Air (prevention and control of pollution) Act 1981, environmental protection Act (EPA) 986, Hazardous waste rules1989, Factory Act 1984 amendments in 1987, Environmental Management System: ISO 14000(EMS) Environmental Audits: methods, components and preparation.

**Unit V:** Various agencies for Environmental Managements in India: Ministry of environment and forest, central pollution control boards, state pollution control boards, local bodies, - their scopes, organizational and functional issues, their working etc.

**Unit VI:** Basics of Data Base Management System (DBMS), Geographic Information System (GIS) and remote sensing in Environmental Management.

**Books Recommended:**


1. Environmental Impact Analysis- a decision Making Tool: By R KJain, McGraw – Hill.
2. Theory and Practice of Environmental Impact Assessment: By Abbasi and Ramesh, Discovery publishing house pvt.ltd.

## 6CE05 : (ii) Human Resource Development & Organizational Behavior

**Learning Objectives of Subject:**

- Student should learn about concept of Management and its utility.
- Student should learn about various types of Organization and its structure.
- Learner should be able to understand the concept of Human Resource Management .
- Learner should understand self development process and its fixity for Organizational need .
- Student should be able to understand and develop skills of Leadership , Team Work , Professional behavior , Job analysis and ethics .
- Student should be able to analyze job , opportunities and growth criteria's.

**Course outcomes:**

**At the end of the subject the students will be able -**

- To understand the concept of Management and Organization.
- To understand types of Organsiation and Its structure.
- To develop himself/ herself as per the need and requirement of work and self updation.
- To develop better skills related to leadership, team behavior, ethics at working place .
- To analyze job opportunity and future in it .
- To understand expectations for job evaluation , assessment of work and growth in the field.

### Section A

**UNIT I**:- Understanding the Term Management and Organization. Learning about various types of Organizations and Organizational chart. Concept and need for Human Resource Management ( HRM) and Human Resource Development (HRD) . Concept, Origin and Need, for HRD as a Total System; Approaches to HRD; Human Development and HRD; Introduction to Organizational Behavior (OB) .

**Unit II** :- Knowing and Managing Yourself Individual Behaviour: MARS model of individual behaviour Values: Values across cultures (Hofstede's framework); Personality: Big five model; MBTI; Use of personality tests; Personality attributes influencing OB Emotions: Understanding emotions; Emotional labour; Emotional Intelligence Attitudes: Attitudes v/s values; Job Satisfaction; Organizational Commitment Perception: Factors influencing perception; Perceptual errors; Self-fulfilling prophecy; Know yourself: Johari window

**Unit III** :- Motivation in the workplace , What is motivation; Types of Motives; Theories of Maslow; Herzberg, McGregor, Alderfers, Porter and Lawler's Model; Job Enlargement, Job Enrichment, Behaviour Modification.

## Section B

**Unit IV** :- Communication What is communication; Organizational communication: Formal networks and Grapevine; Electronic communications; Barriers to effective communication; non-verbal communication; Improving Interpersonal communication: Empathy and Active listening

**Unit V** :- Leadership Difference between managers and leaders; Perspectives of leadership: Trait, Behavioural, Contingency; Inspirational leadership: Transactional, Transformational, Charismatic; NGO leadership

**Unit VI** :- Job Analysis, Job description; Job Specification; Job Evaluation, Recruitment, Selection, Orientation Sources of recruitment: Internal and external; Steps in selection process; Performance Management , What is performance appraisal; Purposes, Process and Uses.
Compensation Management – Need, Objectives and factors determining compensation; Developing pay structures, Executive remuneration; components of compensation; Incentives

**Prescribed Books :**

1. Nadler, Leonard : Corporat Human Resource Development, Van Nostrand Reinhold, ASTD, New York .
2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems, Oxford IBH Pub. Pvt.Ltd., New Delhi , 2005.
3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2004.
4. Viramani, B.R and Seth, Parmila: Evaluating Management Development, Vision Books, New Delhi .
5. Rao, T.V.(et.al): HRD in the New Economic Environment, Tata McGraw-Hill Pub.Pvt, Ltd., New Delhi , 2003.
6. Management & Organisation , Dr A. R Gupta , Google book Publishers.
7. ILO, Teaching and Training Methods for Management Development Hand Book, McGraw-Hill , New York .
8. Rao, T.V: Human Resource Development, Sage Publications, New Delhi .
9. Kapur, Sashi: Human Resource Development and Training in Practice, Beacon Books, New Delhi .
10. Lynton, Rolf. P and Pareek, Udai: Training for Develfopment, Vastaar Publishers, New Delhi .
11. Viramani, B.R and Rao, Kala: Economic Restructuring, Technology Transfer and Human Resource Development, Response Books, New Delhi .
12. Jaya Gopakl, R: Human Resource Development : Coneputal analysis and Strategies, Sterling Publishing Pvt. Ltd., New Delhi .
13. Truelove, Steve.A: hand book of Training and Development, Beacon Books, New Delhi . 14. Goldstein, Irwin : Training in Organisations, Cole Publishing Co., California .

## 6CE05 : (iii) Introduction To Earthquake Engineering

**Course Learning Objective:**

This course will cover the basics of seismology and Earthquake engineering. Students will learn

1. Basic seismology, earthquake phenomenon and its characteristic.
2. Earthquake resistant concept
3. Use of earthquake bands in masonry structure
4. Behavior of buildings during earthquakes

**Course outcomes:**

At the end of the subject the students will be able to -

1. Identify type of earthquake, its properties
2. Earthquake resistance planning
3. Apply knowledge of seismic bands in masonry structure construction
4. Solve engineering problems in the context of Earthquake Engineering.

### SECTION A

**Unit I:** Interior of earth, engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonics features of India, Faults, and Propagation of earthquake waves.

**Unit II:** Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph, accelerogram recording), Determination of magnitude, Epicenter distance, Ground motion and their characteristics, Factors affecting ground motions.

**Unit III:** Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings.

### SECTION B

**Unit IV:** Projections & suspended parts, special construction features like separation of adjoining structure, crumble section, stair case etc., twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking.

**Unit V:** Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structures.

**Unit VI:** Behavior of R.C. building in past earthquakes. Concept of earthquake Resistant design, Introduction to IS: 1893

**Books Recommended:**

1. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007
2. Amita Sinvhal; Understanding Earthquake Disasters, Tata McGraw Hill
3. P. N. Agraval; Engineering Seismology Oxford & IBH Publishing
4. C.V.R. Murty; Earthquake Tips National Information Centre of Earthquake Engineering IIT Kanpur
5. Pankaj Agrawal & Manish Shrikhande ; Earthquake Resistant Designof Structures Prentice- Hall of India

## 6CE06 : Design Of Steel Structure– Lab

**List of Experiments:**

1. Candidates are required to prepare at least **two** designs of steel structures based on theoretical course detailed working drawings are necessary.

2. A compulsory **site visit** for studying the various aspect and prepare a report. A Journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

## 6CE07: Environmental Engineering Lab – I

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva voce based on theory & practical. Graphs are to be drawn wherever necessary

**List of Experiments**

1. Determination of Turbidity of water sample
2.Determination of Electrical Conductivity water sample
3.Determination of pH of water sample
4. Analysis of Dissolved, Suspended and Total solids
5. Analysis of Volatile and Fixed solids
7. Optimum coagulant dose
8.Determination of Temporary and Permanent Hardness of water sample
9.Determination of Acidity & Alkalinity of water sample
10. Determination of Iron and Manganese
11.Determination of residual chlorine in the given water sample
12. Total Count of Bacteria Test

## 6CE08 :Fluid Mechanics – Lab

**Suggested Fluid Practical**

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva voce based on theory & practical. Graphs are to be drawn wherever necessary.

1. Verification of Bernoulli's theorem.
2. Determination of coefficient of discharge for Venturimeter.
3. Verification of Reynold's Number with respect to type of flow.
4. Determination of metacentric height.
5. Determination of friction factor for GI pipe.
6. Determination of coefficient of discharge for rectangular notch.
7. Determination of coefficient of discharge for triangular notch.
8. Determination of Chezy's coefficient.
9. Determination of coefficient of discharge of Venturiflume.
10. Verification of momentum equation.
11. Study of hydraulic jump, calculations of height of jump, length & energy loss.

## 6CE09: Mini Project

Any one Group Project in details.

1) Irrigation Project

2) Rehabilitation of Village / Town

3) Water Supply Project

4) Sewerage System

5) Bridge on River

6) Flood Relief Structures

Students should conduct a detailed survey in a seven day camp.

Data Analysis, Design & Submit Report & Drawing sheets.