

**Faculty of Engineering  
Scheme of Instruction and Syllabi**

**of**

**B.E. IV-YEAR  
(SEMESTER I)**

**of**

**FOUR YEAR DEGREE COURSE**

**IN**

**CIVIL ENGINEERING  
(With effect from the Academic Year 2016-2017)**



**July 2016  
CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY  
(Autonomous)  
Gandipet, Hyderabad- 500075**

## SCHEME OF INSTRUCTION &amp; EXAMINATION

## B.E. IV -YEAR

## CIVIL ENGINEERING

## SEMESTER-I

S.No	Syllabus Ref.No	SUBJECT	Scheme of Instruction			Scheme of Examination			Credits
			Periods per Week			Duration in Hrs	Maximum Marks		
			L	T	D/P		University Exam	Sessionals	
<b>THEORY</b>									
1	CE 411	Design of Steel Structures-II	4	0	2	3	75	25	4
2	CE 412	Estimation and Sepcification	4	1	0	3	75	25	3
3	CE 413	Foundation Engineering	4	0	0	3	75	25	3
4	CE 414	Water Resources Engineering-II	4	0	0	3	75	25	3
5	CE 415	Concrete Technology	4	0	0	3	75	25	3
6		Elective-II	4	0	0	3	75	25	3
		<b>Theory Total</b>	<b>24</b>	<b>1</b>	<b>2</b>	<b>18</b>	<b>450</b>	<b>150</b>	<b>19</b>
<b>PRACTICALS</b>									
1	CE 416	Concrete Technology	0	0	3	3	50	25	2
2	CE 417	Computer Applications in Civil Engineering	0	0	3	3	50	25	2
3	CE 418	Project Seminar	0	0	3	3	--	25	1
		<b>Practicals Total</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>9</b>	<b>100</b>	<b>75</b>	<b>5</b>
			<b>24</b>	<b>1</b>	<b>11</b>	<b>27</b>	<b>550</b>	<b>225</b>	<b>24</b>

L=Lecture, T=Tutorial, D/P= Drawing/Practical

**Elective - II**

CE- 451 Elements of Earthquake Engineering

CE- 452 Surface and Ground Water Management

CE- 453 Health Monitoring of Structures

CE- 454 Finite Elements Method

CE- 455 Design and Detailing of Irrigation Structures

ME- 464 Entrepreneurship

**CE-411****DESIGN OF STEEL STRUCTURES- II**

Instruction	6 Periods per week (4 Theory+2Tutorial)
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	4

Codes required: IS 800 – 2007, steel tables, Bridge rules, Bridge Code (Railways)

Course Objectives: To enable the students

1. Gain exposure to a few basic types of steel structures (Plate Girders, Gantry girders, Trussed girders etc.) and their components , used in Highway bridges , Industrial workshops and Railway bridges .
2. Attain fundamental knowledge of design of plate girder, gantry girder, steel railway bridges (plate girder & truss girder type), rocker & roller bearings and is able to interpret the specifications of relevant codes.
3. Acquire adequate conceptual knowledge and skills to extend the same to investigate into critical issues , compare various options & choose best solution for the problems in the areas of highway , industrial and railway steel structures
4. Consider economy in the design of these structures without suffering the safety, in a given situation.
5. Understand the intricacies of detailing aspects of these structures and their connections
6. Understand, interpret & prepare structural drawings for these steel structures.

Course Outcomes: At the end of the course the students are able to

1. Select and suggest an appropriate type of steel structure for use in Highway bridges, Industrial workshops and Railway bridges.
2. design a plate girder for high way bridges , a gantry girder for industrial workshops , a plate girder & trussed girder for railway bridges and Roller & Rocker bearings for Railway bridges , as per the specifications of relevant codes
3. Compare the design alternatives for these structures and come out with best possible solutions
4. Give economical designs for these steel structures without suffering safety.
5. Suggest suitable detailing aspects for these steel structures and their connections.
6. Understand, interpret and prepare structural drawings for these steel structures.

**UNIT-I**

**Design of Plate girders:** Design of welded plate girder for static loads – Economical Depth, Design of Cross Section, Flange curtailment, intermediate and bearing stiffeners, connections- As per IS 800-2007

## **UNIT-II**

**Design of Gantry girders:** Basic principles, Loads, Codal provisions, Detailed Design- Cross section and connections, Drawing- general layout and cross section;

## **UNIT-III**

**Introduction to Railway Bridges and Design of bearings:** Bridges: Deck and through type bridges – Economical span – Indian standard railway broad gauge train loadings – permissible stresses. Bearings: Types and general description of various bearings, detailed Design of Rocker and roller bearings for railway bridges.

## **UNIT-IV**

**Design of Deck type riveted plate girder railway bridges:** Economical depth, detailed design of Cross section, connections, intermediate and bearing stiffeners, Wind effects-Design of Cross frames Drawing-General layout, generation of longitudinal and cross sections

## **UNIT-V**

**Design of Through type riveted truss girder railway bridges:** Truss configurations, Detailed design of stringer beams, Cross girders and Truss girders; Wind effects-Design of top lateral and bottom Lateral bracing, Portal and sway bracings; Drawing-General layout , generation of longitudinal and cross sections.

### **Text Books :**

1. S.K.Duggal, “Design of Steel Structures, Limit State Method”, 2nd Edition, Tata McGraw Hill Publishing, 2014.
2. A.S Arya and J.L Ajmani “Design of Steel Structures”, Nem Chand & Bros. 1992.

### **Suggested Reading:**

1. N.Subramanian, “Design of Steel Structures, Limit State Method”, Oxford University Press, 2008.
2. M.R Shiyekar, “Design of Steel Structures, (Limit State Method)”, Second Edition, PHI Learning Pvt Ltd. 2013
3. Dr.Ramachandra and Virendra Gehlot, “Design of Steel Structures”, Volume – 2, Scientific Publishers, 2008.
4. Dr. B.C. Punmia and Dr. Ashok Kumar Jain, “ Comprehensive Design of Steel Structures”, Laxmi Publications, 1998.
5. S.S.Bhavikatti, “Design of Steel Structures, Limit State Method”, 2nd Edition, IK International Publishing House Pvt Ltd 2012.

**CE-412****ESTIMATION & SPECIFICATIONS**

Instruction	5 Periods per week (4 Theory + 1 Tutorial)
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:** To enable the students understand

1. The working of detailed estimates for different structures.
2. The working of steel quantities of R.C. works
3. The rate Analysis for different items of works
4. About APDSS and Departmental procedures
5. About contract, Tenders, Earnest Money Deposit (EMD), M-Book and concept of present practices of tenders.

**Course outcomes:** At the End of the course the students should be able to

1. Prepare detailed estimates for different structures and steel quantities for R.C. works.
2. Do the rate analysis for different items of works of buildings
3. Do the rate analysis for different items of Concrete and Bituminous Road works
4. Apply APDSS and departmental procedures.
5. Work out different types of contracts, prepare Tenders, to suit the present day practices of Tendering.

**UNIT - I:**

Working out the detailed estimate for the following- Flat roof building (load bearing, RCC & Steel framed structure), Bituminous and C.C. Road work including earthwork, Single pipe culvert and single cell rectangular box culvert, Septic tank, Irrigation canal work including earthwork.

**UNIT - II:**

Estimation of steel quantities for the following R.C. Works- Slabs, Beams and Columns, Footings - Rectangular, isolated and combined, Stair Case, Overhead rectangular water tank.

**UNIT - III:**

Preparation of analysis of rates and theoretical requirements of materials as per the standard data of APDSS for the following- Major items of works of a building, All items of work of bituminous and concrete road works.

**UNIT - IV:**

General and detailed specification of works as per APDSS, Departmental procedure for construction work, Types of estimates.

**UNIT - V:**

Types of contracts, essentials of contract, condition of contract and recent developments, Tender - Tender form, Tender documents, Tender notice, e-tender work order. Earnest money, Security deposit and new developments, Measurement book and Muster roll.

**Text Books :**

1. B.N. Dutta, Estimating and Costing in Civil Engineering - Theory and Practice, S. Dutta & Co., Lucknow, 2002.
2. M. Chakraborti, Estimating, Costing, Specifications and Valuation in Civil Engineering, 2002.

**Suggested Reading:**

1. Jagjit Singh, Estimating and Costing in Civil Engineering, Galgotia Publications, New Delhi, 1996.
2. Patil, B.S. (2009), Civil Engineering Contracts and Estimation, Universities Press III Edition, Hyderabad.
3. Standard Scheduled Rates and Relevant BIS Codes

**CE-413****FOUNDATION ENGINEERING**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:** To enable the students

1. Understand the stress distribution in the soils for different loading conditions
2. Understand the principle of bearing capacity and settlement analysis.
3. Understand the principles of deep foundations.
4. Deal with the field problems
5. Learn about coffer dams, caissons, and timbering of excavations.

**Course outcomes:** At the End of the course the students should be able to

1. Compute the stress distribution in the ground under different loading conditions.
2. Estimate the bearing capacity of different soils for shallow foundation.
3. Design the deep foundation by piles or wells.
4. Deal with the field problems in laying cofferdams and different dewatering techniques and sampling methods.
5. Interpret and implement the Concepts of Cofferdams , Caissons and Timbering of Excavations

**UNIT-I**

**Stress distribution in Soils:** Boussinesq's and Westergaard's equations for point load. Application of point load formulae for uniformly distributed load on circular area, rectangular area. Use of Newmark's chart (for Boussinesq's eq). Velocity of Elastic theory for soils. Contact pressure distribution.

**UNIT-II**

**Bearing capacity of soils:** Terzaghi's equation for bearing capacity in soils - It's modification for continuous, square, rectangular and circular footings, general and local shear failure conditions. Plate load test as per IS specification. Allowable bearing capacity. Standard penetration test and use of N values for estimating soil conditions and bearing capacity. Proportioning of footings and rafts.

**Settlement Analysis:** Computation of pressures before loading and after loading. Estimation of settlement - ultimate and after any given period. Correction for construction period.

**UNIT-III**

**Pile Foundations:** Types of piles - Timber, steel, concrete, cast-in situ, precast piles, bearing piles, friction piles, compaction piles, large diameter piles. Pile capacity - Static formulae, dynamic formulae, pile load test, determination of point resistance and skin friction as per IS code. Bearing capacity of pile groups, negative skin friction.

#### **UNIT-IV**

**Coffer dams:** Earth embankments, cantilever sheet piles, braced coffer dams. Double wall cofferdams, cellular coffer dams – circular, diaphragm type, general description and construction methods.

**Caissons:** types of caissons – Open caissons, pneumatic caissons, box caissons (floating caissons). General description and construction methods. Dewatering techniques: sumps, ditches. Well points, deep walls. Geo-textile methods: Types and uses.

#### **UNIT-V**

**Timbering of excavation:** Bracing for shallow and deep excavations. Computation of lateral earth pressure. Reaction of struts.

**Underpinning:** Preliminary support – shorting, needling and their combination. Plain pier underpinning, pretest cylinders, grouting, chemical stabilization.

**Site investigation:** Principles of exploration, sampling methods, transportation and storage of samples, boring and drilling methods, log of bore holes, sampling tubes and samplers. Sampling records.

**Machine Foundations:** types, frequency, Amplitude, Resonance.

#### **Text Books:**

1. Dr. K.R Arora, "Soil Mechanics and Foundation Engineering", 5<sup>th</sup> Edition, Standard Publishers, 2005.
2. Gopal Ranjan and A.S.R Rao, " Basic and Applied Soil Mechanics", 2<sup>nd</sup> Edition, New Age International.

#### **Suggested Reading:**

1. Dr. B.C Punmia and Ashok Kumar Jain and Arun Kumar Jain, "Soil Mechanics And Foundations", Laxmi Publications, 16<sup>th</sup> Edition, 2005.
2. E. Bowles Joseph, "Foundation Analysis And Design", Tata Mc Graw Hill 1997.



**CE-414****WATER RESOURCES ENGINEERING- II**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:** To enable the students understand

1. Reservoir planning, site selection and selection of hydraulic structures, and practical utilization of reservoirs
2. Various types of dams, their components and their selection criteria
3. The concepts of stability analysis of Gravity dams under various types of forces and the procedure for working out their elementary and practical profiles
4. Various types and methods of construction of Earth dams, concepts of seepage analysis, causes of failures and Design criteria
5. Various types of spill ways and their suitability, various types of energy dissipation devices and their application
6. The concepts of Water Power Engineering and the layout & basic components of a power house

**Course outcomes:** At the End of the course the student will be able to

1. Reservoir planning, site selection and selection of hydraulic structures.
2. Select a suitable type of a dam and it's components for a given situation
3. Perform stability analysis of gravity dams and work out the elementary and practical profiles.
4. Suggest a suitable type and method of construction of an earth dam, perform seepage analysis and design it
5. Suggest a suitable type of spill way and energy dissipation devices for a given dam and situation
6. Apply the concepts of Water Power Engineering in practice and suggest a suitable basic lay out of a power house.

**UNIT -I**

**Types of Reservoirs:** Selection of Site, Storage Capacity Analysis, Reservoir Sedimentation, Flood Routing through retarding basin.

**UNIT-II**

**Storage Head Works :** Types of dams, advantages & disadvantages, selection criteria, Economical height of the dam, Gravity dams, Forces acting on dam, stability analysis, Principal stresses, Elementary Profile and Practical Profile, Low and High Gravity dams.

**UNIT-III**

**Earth Dams:** Types, methods of construction, Seepage analysis for homogeneous and zoned embankment dams, Drainage in embankment dams, Drainage in embankment dams, various types of filters, failure of Earth dams & Design Criteria.

#### **UNIT-IV**

**Spill Ways & Energy Dissipation:** Types of Spill Ways, Ogee Spill ways, Design of Ogee Profile, Fixation of levels, Syphon Spill Way & Chute Spill Way. Energy Dissipaters, Hydraulic Jump & Bucket type dissipaters, Tail water rating curve & Jump Height Curve.

#### **UNIT-V**

**Water Power Engineering:** History, demand and generation, flow duration curve, types of Hydel Plants, Water Conveyance, Penstocks & Surge tanks, powerhouse layout and components – their functions.

#### **Text Books:**

1. Modi, P. N. Irrigation, Water Resources and Water Power Engineering, Standard Publishers, New Delhi, 2008.
2. B.C. Punmiya & B.B. Lal, Irrigation & Water Power Engineering, Laxmi Publishers, 2011
3. S. K. Garg, Irrigation Engineering. & Hydraulic Structures, Khanna Publishers , 2006

#### **Suggested Reading:**

1. Ralph A.Wurbs and Wesley.P.James, Water Resources Engineering, Pearson, New Delhi, 2015
2. Dandekar M M & Sharma K N, Water Power Engineering, Vikas Publishers, New Delhi, 2013.
3. Larry. W. May's, Water Resources Engineering, John Wiley and Sons, 2001.
4. Asawa Gil, Irrigation Engineering, New Age publications co, 1999.
5. Murthy C.N., "Water Resources Engineering, New Age International, 2002.

**CE-415****CONCRETE TECHNOLOGY**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:** To enable the students

1. Understand the properties of various components of concrete.
2. Study the behavior of concrete in its fresh and hardened state
3. Study about the concrete mix design using various methods
4. Know about the various admixtures and their influence
5. Understand various special concretes and their uses

**Course outcomes:** At the end of the course, the students will be able to

1. Explain and determine the properties of the constituents of concrete.
2. Explain and determine the properties of fresh and hardened concrete.
3. Design concrete mixes and apply statistical quality control techniques to concrete quality.
4. Select proper types and dose of admixtures for the purpose
5. Design special concretes and employ for specific applications.

**UNIT-I**

**Constituents of concrete:** types of cements and their composition. Tests on various properties of aggregates

**Properties of fresh concrete:** Mixing and batching. Workability, factors effecting workability, Measurement of workability, various tests procedures. Segregation and bleeding. Vibration of concrete. Types of vibrators and their influence on composition. Analysis of fresh concrete.

**UNIT-II**

**Properties of Hardened concrete:** Strength of concrete. Water cement ratio. Gel space ratio. Effective water in the mix. Short terms and long term properties of concrete. Tests and procedure. Influence of various parameters on strength of concrete. Relationship between various mechanical strengths of concrete. Curing of concrete. Methods of curing. Maturity concept. Influence of temperature on strength of concrete. Stress-Strain curves for concrete. Durability of concrete.

**UNIT-III**

**Mix design of concrete:** Basic consideration. Process of mix design. Factors in the choice of mix proportions and their influence. Quality control. Various methods of mix design. I.S. 10262 - 2009 by method, British and ACI methods.

#### UNIT-IV

**Admixtures used in concrete:** Classification of admixtures. Chemical and mineral admixtures. Influence of various admixtures on properties of concrete. Applications. Concept of ready mixed concrete. Fly ash concrete – properties and proportion of fly ash, applications.

#### UNIT-V

**Special Concretes:** High strength concrete, Ferro cement, Light weight concrete. High density concrete. Recycled aggregate concrete. Their specialties and applications.

**Fibre Reinforced Concrete:** Need for Fibre reinforced concrete (FRC), Mechanism of FRC, types of Fibres, fibre shotcrete.

#### Text Books :

1. A.M Neville., “Properties of Concrete”, English Language Book Society / Longman Publications, 1998.
2. M.S Shetty, “ Concrete Technology”, S.Chand Publications, 2005.

#### Suggested Reading:

1. A.M. Neville and J.J. Brooks, “Concrete Technology”, Dorling and Kindersley Publications, 2006.
2. Mehta P.K., and Paulo J.M.M., Concrete- Microstructure – properties and Material, Mc.Graw Hill Publishers, 1997.
3. Krishnaraju N., Design of Concrete Mix, CBS Publishers, 1985.

**CE-451**                      **ELEMENTS OF EARTHQUAKE ENGINEERING**  
**(Elective - II)**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:** To enable the student

1. Understand the causes of earthquakes , their Magnitude & effects and various types of earthquake waves
2. Understand the concepts of damped and un damped vibrations and the response of single , two and multi-degree systems to these vibrations , and concepts of Response spectrum
3. Understand the concepts of Seismic Design Philosophy and Earthquake Resistant Design of Masonry , RC and Steel structures
4. Gain knowledge of Seismic Performance of Engineered and Non-Engineered Urban and Rural buildings
5. Understand the basic concepts of Seismic resistant construction , Base isolation techniques and other energy dissipation devices and Concepts of Seismic retrofitting
6. Review various case studies of past earthquakes , and performance of buildings during those earthquakes

**Course outcomes:** At the end of the course , the student is able to

1. Assess the cause of an earthquake , it's magnitude and it's effects on structures
2. Apply the concepts of Damped and Un-damped Vibrations to single , two and multi-degree systems and deduce a response spectrum
3. Apply the concepts of Seismic Design Philosophy and Earthquake Resistant Design to Masonry , RC and Steel structures
4. Evaluate the Seismic Performance of Engineered and Non-Engineered Urban and Rural buildings
5. Apply the concepts of Seismic Resistant Construction , Base isolation techniques and other energy dissipating devices and also the concepts of Seismic Retrofitting
6. Use and interpret the knowledge gained from the case studies of performance of buildings during past earthquakes

**UNIT - I**

**Engineering Seismology:** Causes of earthquakes - Seismic waves-Magnitudes, intensity and energy release - characteristics of strong earthquake ground motions - Soil effects and Liquefaction

## **UNIT - II**

**Theory of Vibrations:** Introduction to theory of vibrations- Flexibility of long and short periods structures- single, two and multi- degree of freedom systems - Concept of response spectrum - response spectrum analysis. Concepts of damped and undamped vibrations

## **UNIT - III**

**Seismic Design Philosophy :** Concept of Seismic resistant design, reduction factors - Over strength, Ductility and Redundancy -Determination of earthquake forces on structures. Seismic Design and details of masonry, Reinforced Concrete and Steel buildings.

## **UNIT - IV**

**Seismic Performance of Buildings:** Case Studies of a few serious earthquakes in the country in the past- Damages to buildings - Damage Patterns - Performance of Non-Engineered Buildings, Rural houses during the Earthquakes

## **UNIT - V**

**Earthquake Resistant Construction:** Basic Principles , Concepts of earthquake resistant constructions in rural area, Base isolation and energy dissipation devices. Seismic Retrofitting - Repair, rehabilitation and retrofitting, retrofitting strategies - Importance of re-analysis. A case study of a rural building.

### **Text Books :**

1. Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd, 2006
2. Steven L Kramer, " Geo-Technical Earthquake Engineering", Pearson Education Ltd, 2013.

### **Suggested Readings:**

1. A.K. Chopra, " Dynamics of Structures", Pearson Education, 2012.
2. A.R Chandrasekaran, J. Krishna, B.Chandra, "Elements of Earthquake Engineering", South Asian Publishers Pvt. Ltd, 2000.

**CE-452 SURFACE & GROUND WATER MANAGEMENT  
(Elective - II)**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:**

1. To equip the students with the knowledge of applications and analysis of various water resource systems including planning and management.
2. Equip the students with the knowledge of identification and evaluation of water management plans.
3. To introduce concepts of basin management and various issues related to water logging and salinity
4. Enable the students to interpret and implement groundwater recharge and modeling of ground water flow.
5. To introduce the concepts of various artificial recharge methods of ground water.
6. To impart knowledge in managing water through simulation model, linear and dynamic programming.

**Course outcomes: The students will be able to**

1. Apply the concepts of analysis for planning of water resource systems.
2. Implement the concepts of artificial ground water recharge.
3. Formulate and solve deterministic optimization models for design and operation of water resources systems.
4. Evaluate ground water response through models.
5. Evaluate the application of various modeling techniques related to reservoir and irrigation operation.
6. Interpret and implement linear and dynamic programming in managing the water resources.

**UNIT-I**

**Planning and Analysis of Water Resource Systems:** Introduction to water resource planning, water resource planning, water resource systems, characteristics of systems analysis and application.

**UNIT-II**

**Identification and Evaluation of Water Management plan:** Introduction, plan formulation, planning models and solution procedures, objective functions and constraint equations, Lagrange multipliers. Slack and surplus variables, Dynamic programming, Recursive equations. Linear programming - General approach; Geometrical approach and interpretation, simulation - Definition, types of simulation models.

### **UNIT-III**

**Management of Ground Water:** Introduction, concepts of basin management, equation of hydrologic equilibrium, ground water basin Investigations, data collection and field work, alternative basin yields, evaluation of perennial yield, salt balance, Basin management and connective use, example of ground water management. Salinity and water logging problems.

### **UNIT-IV**

**Artificial Recharge of Ground Water:** Introduction, concept of artificial recharge, recharge methods, waste water recharge for reuse, Recharge mounds, induced recharge

### **UNIT - V**

**Modeling Techniques and Applications:** Introduction, porous media models – Sand tank model, analog models – Viscous fluid model membrane model. Thermal models, blotting paper models, Dynamic Programming – Applications to reservoir operation and irrigation operation models. Linear programming – Applications to water resource problems.

#### **Text Books :**

1. David Keith Todd, "Ground Water Hydrology", John Wiley & Sons, NY, Third Edition, 2005.
2. K.Srinivasa Raju and D.Nagesh Kumar (2014) Multicriterion Analysis in Engineering and Management, Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi, ISBN 978-81-203-3976-7, pp.288.

#### **Suggested Reading**

1. Danierl P. Loucks. Jerry R. Stedinger. Douglas A. Haiths, "Water Resources Planning and Analysis", Prentice Hall, Inc. Eaglewood Cliffs, NY, 2005.
2. John. A. Dracup, Warren. A. Hall, "Water Resources System Engineering", McGraw hill Book Co., NY, 1970.
3. R. Paneer Selvam, " Operations Research", PHI Learning Pvt. Ltd, Second Edition 2009.



CE-453

## HEALTH MONITORING OF STRUCTURES (Elective- II)

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:** To enable the students to

1. Understand SHM as a way of monitoring health of a structure using smart materials.
2. Learn and apply the various techniques for monitoring the health of the structure.
3. Comprehend the methods of condition assessment of damages in buildings.
4. Learn the applications of using capacitive probe method.
5. Learn about implementation of health monitoring in different types of structures.

**Course outcomes:** At the end of the course the graduate should be able to

1. Analyze results obtained from monitoring the health of the structures.
2. Select and implement an appropriate technique for health monitoring.
3. Select and implement an appropriate capacitive sensing technique.
4. Perform condition assessment survey of damaged/ existing buildings.
5. To identify possible defects in a concrete structure and suggest necessary repairs.
6. Implement various health monitoring techniques for different types of structures for different situations .

### UNIT-I

**Introduction of Structural Health Monitoring (SHM) :** Definition & motivation for SHM, Objectives, SHM - a way for smart materials and structures, SHM and bio mimetic - analog between the nervous systems of a man and structure with SHM, SHM as a part of system management, Passive and Active SHM, NDE, SHM, and NDECS, basic components of SHM, materials for sensor design.

### UNIT-II

**Techniques used for structural health monitoring:** SHM using vibration based technique- Introduction- Local and global methods- Applications, SHM using fibre optic sensors- Introduction- Classification of fiber-optic sensors- Applications, SHM using Low Frequency Electromagnetic Techniques- Introduction- Applications to the NDE/NDT domain & SHM domain.

### UNIT-III

**Capacitive Method for SHM:** Introduction of capacitive methods, the principle, types of capacitive sensing, capacitive probe for cover concrete- Capacitive sensing in bridges (case studies), Applications for external post - tensioned cables, Capacitive sensing in monitoring historical buildings.

#### **UNIT-IV**

**Condition Survey & NDE of Concrete Structures:** Definition and objective of Condition survey, stage of condition survey (Preliminary, Planning, Inspection and Testing Stages), possible defects in concrete structures, quality control of concrete structures – Definition and need, Quality control applications in concrete structures, NDT as an option for Non-Destructive Evaluation (NDE) of Concrete structures, case studies of a few NDT procedures on concrete structures.

#### **UNIT - V**

**Case studies on structures:** Buildings-historic buildings- smart buildings, Special structures- bridges- dams- tunnels.

#### **Text book:**

1. Daniel Balageas, Claus - Peter Fritzenaml Alfredo Guemes, Structural Health Monitoring, Published by ISTE Ltd., U.K. 2006.
2. Hand Book on Seismic Retrofitting of Buildings, published by CPWD & Indian Building Congress in association with IIT, Madras, Narosa Publishing House, 2008.

#### **Suggested Reading:**

1. Guide book on Non-destructive testing of concrete structures, Training course series No. 17. International Atomic Energy Agency, Vienna, 2002.
2. Hand Book on “Repair and Rehabilitation of RCC Buildings”. Published by Director General, CPWD, Govt. of India, 2002.

CE 454

**FINITE ELEMENT METHODS**  
**(Elective-II)**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives: From this course, the students**

1. Learn the fundamental concepts of the theory of the finite element method.
2. Apply FEAM to design problems
3. Understand basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
4. Get proficiency in the application of the finite element method (modeling, analysis, and interpretation of results) to realistic engineering problems through the use of a major commercial general-purpose finite element code
5. Get the concepts to Solve different domain problems like structural, thermal, fluid flow problems.

**Course outcomes: At the end of the course, the students**

1. Get an understanding of the fundamental theory of the FEA method;
2. Possess the ability to generate the governing FE equations for systems governed by partial differential equations;
3. Understand the use of the basic finite elements truss, beam, frame, and plane elements for structural applications
4. Demonstrate the ability to create models for trusses, frames, plate structures, machine parts, and components using ANSYS general-purpose software.
5. Demonstrate the ability to evaluate and interpret FEA analysis results for design and evaluation purposes;
6. Develop a basic understanding of the limitations of the FE method and understand the possible error sources in its use

**UNIT-I**

**Introduction to FEM:** Types of Problems – Types of Materials – Elastic / Inelastic situations – Types of forces: Body forces / Surface Traction / Point loads – Deformable bodies – Types of Deformations – Homogeneous / Non homogeneous Problems – Equations of equilibrium for elastic 2-D / 3-D continua - Equilibrium equations for 2-D / 3-D boundary elements – Boundary conditions – Strain-displacement relation for 2-D / 3-D – Stress-strain relation for 2-D / 3-D – Plane stress / Plane strain problems.

**Virtual Work Formulation:** Application to problems of plane trusses with static indeterminacy not exceeding three.

**Finite Difference Method with Central Differences:** Solving ODE's and PDE's with central differences. Application to beam and plate bending problems of simple geometry.

## UNIT-II

**Variational Formulation :** Finite Element Formulation - Stationarity of Functional – Given the Functional or Differential equation – Number of elements limited to two.

**1-D Elements:** Strain-displacement relation matrix / stiffness matrix / Minimum Potential Energy Approach / Rayleigh-Ritz Method / introduction to natural coordinates / stiffness matrix of second order bar element / Axial bar subjected to point loads, body forces and surface traction forces / Problems with kinematic indeterminacy not exceeding two.

**2-D Triangular Elements:** Displacement models / criterion for convergence / geometric invariance / conforming and non conforming elements - 3-node triangular elements (CST) / determination of strain-displacement matrix / area coordinates-shape functions / determination of element stiffness and load matrices, assembling global stiffness and load matrices / Problems with kinematic indeterminacy not exceeding three.

**2nd Order triangular elements:** Shape functions – degradation technique / strain-displacement matrix / Expression for stiffness matrix / Load matrices due to body forces and surface traction.

## UNIT-III

**Iso-parametric elements:** Quadrilateral elements: Construction of shape functions using natural coordinates/Strain-displacement matrices/Load matrices for body force and surface traction/ Expressions for stiffness matrix, load matrices for 4-noded quadrilateral elements/ Gauss Quadrature of numerical integration / Problems with rectangular elements, kinematic indeterminacy not exceeding three.

**2nd Order Quadrilateral elements:** - Determination of shape functions for 2nd order quadrilateral elements and for elements of with serendipity / Strain-displacement matrices / Load matrices for body force and surface traction.

## UNIT-IV

### **Method of Weighted Residuals:**

Galerkin's Method of Weighted Residuals – Application to problems of mathematics / structural engineering, number of trial functions not exceeding two.

Galerkin's Finite Element Method – Weak form of Trial Function - Application to problems of mathematics / structural engineering, number of elements limited to two.

Applications in Fluid mechanics – Governing equations for incompressible flow / rotational and irrotational flow/ Finite element formulation: Stream Function and Velocity Potential Function in 2-D flow with demonstration of one example each.

## UNIT-V

**Axi-symmetric Problems:** Strain-displacement relationship/stress-strain relationship / determination of stiffness matrix for 3-noded ring element and load matrices for body force and surface traction/ Problems with kinematic indeterminacy not exceeding three for 3-noded ring elements only.

**Tetrahedron elements:** Volume coordinates, Strain-displacement matrix, stiffness matrix, load matrices due to body force and surface traction/ introduction to Hexahedron (brick) elements.

**Introduction to MSC Nastran:** Illustration on different modules of Nastran / Structural engineering applications of the package/Creation of a simple 1-D model, 2-D model and a 3-D model/ analysis and post processing of the results.

### Text Books :

1. Chandrupatla, T. R. And Belegundu, A. D, (2001). "Introduction to Finite Elements in Engineering", Prentice Hall of India, New Delhi.
2. Cook, R. D. (1981). "Concepts and Application of Finite Element Analysis", John Wiley and Sons.
3. Reddy, J. N, (1993). "An Introduction to the Finite Element Method", McGraw Hill, New York.

### Suggested Reading:

1. Zienkiewicz, O. C. And Taylor, R. L, (1989). "The Finite Element Method", Vol.1, McGraw Hill Company Limited, London.
2. Seshu. P, (2003). "Finite Element Analysis", Prentice Hall of India Private Limited, New Delhi.
3. David V. Hutton, (2005). "Fundamentals of Finite Element Analysis", Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Bathe, K. J, (2006). "Finite Element Procedures", Prentice Hall of India, New Delhi.
5. Desai C.S. and Abel J.F, "Introduction to the Finite Element Method", Van Nostrand, 2002.
6. Krishna Moorthy C.S., "Finite Element Analysis", Tata Mc. Graw Hill, 1997.

**CE-455      DESIGN AND DETAILING OF IRRIGATION STRUCTURES (DDIS)  
(Elective-II)**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course Objectives :** The student should be able to understand the

1. Principles of a surplus weir
2. Design of direct sluice
3. Basic principles of glacis type canal drop
4. Basic principles of Design of Cross regulator
5. Design of super passage.
6. Detailing in marking to the above structures

**Course Outcomes:** The Student will be able to design procedures and detail a

1. Surplus weir
2. Direct sluice
3. Glacis type canal drop
4. Cross regulator
5. Super passage.
6. The Student should be thorough in giving marking to the structures

**UNIT - I:-**

**Surplus Weir:-** Components of surplus weir - computation of flood discharge - Design of surplus weir & detailing

**UNIT-II:-**

**Direct Sluice:-**Hydraulic particulars - General arrangements of various components - Design of vent way, Sluice barrel, Head walls, Wing Walls and return walls - Detailing

**UNIT-III:-**

**Glacis type Canal Drop:-** Components, General arrangements, Fluming ratio, fixing the crest level, length of weir, U/S and D/S glacis, Transitions - Protection works - Curtain wall, Energy dissipation arrangements - Design & Detailing

**UNIT-IV:-**

**Cross Regulator:** General design principles - General arrangements of various components - design of vent way by drowning ratio - arrangements of energy dissipation - U/S & D/S protection works - Design & Detailing.

**UNIT-V:-**

**Super Passage:-** Hydraulic particulars of drain & Canal - U/S & D/S transitions - TEL's - fixing vent way - design of trough - Afflux in the canal - Proposal sketch of the super passage including transitions.

**Concepts of Syphon design.**

**Text Books :**

1. Irrigation & Water Power Engineering by B.C.Punmia, Lakshmi Publications, 2009.
2. Design of Minor Irrigation and Canal Structures by C .Satyanarayana Murthy, Wiley Eastern Ltd, 1990.
3. Irrigation Engineering and Hydrualic Structures by S.K.Garg, Khanna Publications.

**Suggested Reading :**

1. Theory And Design of Irrigation Structures, by Varshney and Gupta, Nem Chand Publications
2. Water Resources Engineeing Principles and Practice by C.Satyanarayana Murthy, New Age International Publishers.
3. "Design of Small Canal Structures", USBR Manual, 1978.
4. Relevant BIS codes.

**ME-464**

**ENTREPRENEURSHIP  
(Elective- II)**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives:**

1. To understand the essence of Entrepreneurship
2. To know the environment of industry and related opportunities and challenges
3. To know the concept a procedure of idea generation
4. To understand the elements of business plan and its procedure
5. To understand project management and its techniques
6. To know behavioral issues and Time management

**Course outcomes:** After completing this course, students will be able to:

1. Apply the entrepreneurial process
2. Analyze the feasibility of a new business venture and preparation of Business plan
3. Ability to evaluate entrepreneurial tendency and attitude
4. Brainstorm ideas for new and innovative products or services
5. Use a variety of feasibility studies, assess and select prospective new venture concepts
6. Describe how to investigate financing alternatives for specific new venture concepts

**UNIT-I**

**Indian Industrial Environment**-competence, Opportunities and Challenges. Entrepreneurship and Economic growth. Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries. Types of enterprises, Corporate Social Responsibility.

**UNIT-II**

**Identification and characteristics of entrepreneurs.** Emergence of First generation entrepreneurs, environmental influence and women entrepreneurs. Conception and evaluation of ideas and their sources. Choice of Technology - Collaborative interaction for Technology development.

**UNIT-III**

**Business plan:** Introduction, Elements of Business Plan and its salient features. Technical Analysis, Profitability and Financial Analysis, Marketing Analysis. Feasibility studies, Executive Summary.



#### **UNIT-IV**

**Project Management** during construction phase, project organization, project planning and control using CPM, PERT techniques. Human aspects of project management. Assessment of tax burden

#### **UNIT-V**

**Behavioral aspects of entrepreneurs:** Personality - determinants, attributes and models. Leadership concepts and models. Values and attitudes. Motivation aspects. Change behaviour. Time Management: Various approaches of time management, their strengths and weaknesses. The urgency addiction and time management matrix.

#### **Text Books:**

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.

#### **Suggested Reading:**

1. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
2. G.S. Sudha, "Organizational Behaviour", 1996.
3. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", Tata Me Graw Hill Publishing Company Ltd., 5th Ed., 2005

**CE 416****CONCRETE LABORATORY**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course objectives**

1. To understand properties of constituent materials of concrete
2. To comprehend the behavior of fresh concrete
3. To understand mechanical behavior hardened concrete
4. To acquire knowledge of conducting Non-Destructive testing on concrete structures

**Course outcomes:** After completing this course, students will be able to:

1. Test different concrete mixing materials and issue test reports
2. Assess the workability of field concrete and guide the site supervisor in mixing a good concrete
3. Perform tests on mechanical characteristics of concrete and issue test reports.
4. Handle NDT equipment and conduct tests on concrete structures

**List of Experiments:**

1. a) Determination of specific gravity of cement  
b) Determination of unit weight or bulk density of cement.
2. Determination of normal consistency of cement.
3. a) Determination of initial setting time of cement  
b) Determination of final setting time of cement
4. a) Preparation of mortar cubes for compressive strength.  
b) Test on mortar cubes for compressive strength
5. To find fineness of cement by sieving and by air permeability method
6. a) Determination of specific gravity of fine aggregate  
b) Determination of bulk density of fine aggregate
7. a) Determination of specific gravity of coarse aggregate  
b) Determination of bulk density of coarse aggregate
8. Test on bulking of sand
  - a) Laboratory method
  - b) Field method
9. Determination of fineness modulus of fine aggregate.

10. Determination of fineness modulus of coarse aggregate
11. Tests on study of workability
  - a) Slump
  - b) Compaction factor
12. Tests on hardened concrete
  - a) Compressive strength
  - b) Flexural Strength
13. Non- Destructive Testing of Concrete structures (Demonstration only )

**Text Books:-**

**Suggested Reading:-**

**CE 417      COMPUTER APPLICATIONS IN CIVIL ENGINEERING**

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course Objectives:** To enable the students:

1. Gain exposure to a few software packages used in various areas of Civil Engineering (structural design, construction management, surveying, estimation & costing, water supply, water resources and soil mechanics) and the applications of these software packages.
2. Attain the fundamental knowledge of navigation of these software packages.
3. acquire adequate conceptual knowledge and skills to use these software packages in the field in order to provide to Civil Engineering problems
4. provide accelerated/time bound solutions with help of these software packages without effecting the accuracy of computations
5. understand the aspects debugging, if errors occur while using these software packages
6. understand and interpret the outputs from these software packages

**Course Outcomes:** At the end of the course the students are able to:

1. Use the relevant software packages in various areas of Civil Engineering
2. Prepare the input data, navigate through the software packages, create the model of the entity, debug and interpret the output.
3. Correlate the theoretical concepts and functioning of the software packages.
4. compare the design alternatives in solving the problem on hand, using these software packages and come out with best possible solution
5. Meet the time lines given for the solution of the problem on hand, by using the software packages.
6. Learn upgraded versions of these software packages that would be released by the vendors of these packages from time to time in future, given the experience on the current version of the packages.

**List of Exercises:**

1. Analysis of a plane frame using STAAD Pro
2. Preparation of PERT and CPM networks using Open work bench/Microsoft project
3. Preparation of Contour Maps and Alignment fixing of Roads by using AUTO CIVIL.
4. Digitization of Topo sheets using GIS.
5. Map overlay using GIS
6. Quantity estimation of a simple building using BEST

7. Pipe network analysis using PV net/EPANET
8. Estimate groundwater levels using Visual MOD flow flex
9. Slope stability analysis using Oasys

**Text Books:-**

**Suggested Reading:-**

**CE 418****PROJECT SEMINAR**

Instruction	3 Periods per week
Sessional	25 Marks
Credits	1

Dealing with a real time problem should be the focus of under graduate project.

Faculty members should prepare project briefs (giving scope and references) well in advance, which should be made available to the students in the department.

The project may be classified as hardware / software modeling / simulation. It may comprise any or all elements such as analysis, design and synthesis.

The department should appoint a project coordinator who will coordinate the following.

- Grouping of students ( a maximum of 3 in group )
- Allotment of projects and project supervisors.
- Project monitoring at regular intervals.

All project allotment are to be completed by the 3<sup>rd</sup> week of IV-Year, I-Semester, so that the students get sufficient time for completion of the project by the end of II-semester.

Efforts to be made that the some of the projects are carried out in reputed industries / research organizations with the help of industry coordinators. Problems can also be invited from the industries to be worked out through undergraduate projects.

Oral presentation is an important aspect of engineering education. The students have to deliver a seminar on the 'project' they have chosen or allotted by the department, on the advice and approval from the faculty members. Students are exposed to the following aspects for seminar presentation.

- Literature Survey
- Organization of the material
- Power point presentation
- Technical writing

Each student project batch is required to:

1. Submit a one-page synopsis before the seminar talk for display on the notice board.
2. Give a 20-30 minutes presentation through power point presentation.
3. Submit a report on the project with list of references and slides used.

Project Seminars are to be scheduled from the 4<sup>th</sup> week of the I-semester to the last week of the I-semester.

For award of Sessional marks students are judged by the project coordinator and guide on the basis of an oral and written presentation as well as their involvement in the discussions.

**Faculty of Engineering**  
**Scheme of Instruction and Syllabi**  
**of**  
**B.E. IV-YEAR**  
**(SEMESTER II)**  
**of**  
**FOUR YEAR DEGREE COURSE**  
**IN**  
**CIVIL ENGINEERING**  
**(With effect from the Academic Year 2016-2017)**



**July 2016**  
**CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY**  
**(Autonomous)**  
Gandipet, Hyderabad-500075

## SCHEME OF INSTRUCTION &amp; EXAMINATION

B.E. IV -YEAR  
CIVIL ENGINEERING

## SEMESTER-II

S.No	Syllabus Ref.No	SUBJECT	Scheme of Instruction			Scheme of Examination			Credits
			Periods per Week			Duration in Hrs	Maximum Marks		
			L	T	D/P		University Exam	Sessionals	
<b>THEORY</b>									
1	CE 421	Construction Management And Administration	4	0	0	3	75	25	3
2	CE- 462	Advanced Reinforced Concrete Design	4	0	0	3	75	25	3
3		Elective-III	4	0	0	3	75	25	3
4		Elective-IV	4	0	0	3	75	25	3
		<b>Theory Total</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>300</b>	<b>100</b>	<b>12</b>
<b>PRACTICALS</b>									
1	CE 423	Seminar	0	0	3	--	0	25	1
2	CE 424	Project	0	0	6	Viva	100	50	9
		<b>Practicals Total</b>	<b>0</b>	<b>0</b>	<b>9</b>		<b>100</b>	<b>75</b>	<b>10</b>
			<b>16</b>	<b>0</b>	<b>9</b>		<b>400</b>	<b>175</b>	<b>22</b>

L=Lecture, T=Tutorial, D/P= Drawing/Practical

**Elective - III**

CE- 461 Ground Improvement Techniques

CE- 422 Disaster Mitigation &amp; Management

CE- 463 Construction Technology &amp; Project Management

CE- 464 Bridge Engineering

CE- 465 Services, Maintenance and Repair of Buildings

ME- 414 Operational Research

**Elective - IV**

CE- 466 Urban &amp; Rural Planning

CE- 467 Transportation Planning

CE- 468 Sustainable Development &amp; Value Engineering

CE- 469 Water Shed Management

ME- 472 Intellectual Property Rights

CS- 403 Information Security



## CE-421 CONSTRUCTION MANAGEMENT and ADMINISTRATION

Instruction	4 Periods per week
Duration of Main Examination	3 Hours
Main Examination	75 Marks
Sessionals	25 Marks
Credits	3

**Course Objectives:** To make the student

1. Understand the significance & aspects of construction management, and principles & types of organization.
2. Understand various planning & controlling tools like bar charts, and network techniques for solving construction problems.
3. Acquire knowledge about time-cost analysis, construction contracts & safety, project delivery methods and laws applicable to construction in India.
4. Understand optimization techniques for decision-making in construction Industry.

**Course Outcomes:** At the end of the course, student should be able to:

1. Successfully apply management skills in positions within the construction industry.
2. Apply technical skills and knowledge in construction, and technology in support of planning, analyzing, and solving construction problems.
3. Apply professional and ethical standards of behavior in dealing with all stakeholders to manage a quality construction project from start to completion, while maintaining budget, time - schedule, quality and safety requirements.
4. Put in efforts to manage the construction sites accident-free as far as possible and deal with untoward incidents efficiently.
5. Apply optimization techniques to decision-making scenarios in professional endeavors.

### UNIT-I

**Significance of construction management:** objectives and functions of construction management, construction management team, principles of organization, types of organization.

### UNIT-II

**Construction Planning:** Large scale production, economics of large scale production. Construction planning, bar charts, network techniques in construction management, CPM and PERT.

### UNIT-III

**Time Cost Analysis:** Cost time analysis in network planning, updating, simple problems of civil engineering works.

**Time estimate:** expected likely, pessimistic and optimistic time, normal distribution curve and network problems.

#### **UNIT-IV**

**Contracts:** Introduction, types of construction contracts and their advantages and disadvantages, conditions of contracts, safety in safety in construction and safety measures, workmen compensation act, contract labour act. Demolition of Buildings.

**Tender:** Tender form, Tender Documents, Tender Notice, Work Order.

**Project Delivery Methods:** BOT, SBOO, BOOT; Public Private Partership (PPP), Detailed Report (DPR)

#### **UNIT-V**

**Optimization:** Optimization through linear programming, need for linear programming, linear programming model, graphical method, simplex method and linear programming in construction.

#### **Text Books :**

1. Gahlot P.S. and Dhir. B.M., Construction Planning and Management, Wiley Eastern LTd., 1992.
2. Punmia B.C. and Khandelwal, PERT and CPM, Lakshmi Publications 1990.

#### **Suggested Reading:**

1. Seetharaman, " Construction Engineering and Management, 4th Edition, Umesh Publications, New Delhi, 1999
2. Srinath L.S., PERT and CPM: Principles and Application, East West Press, 1975
3. Mahesh Varma, Construction Planning and Equipment, Metropolitan Book Co. Pvt. LTd., 1985.
4. Taha H., Opeartions Research, Wiley Int., 2002.
5. Gupta .V.K, "Operations Research", S.Chand Publications, 2008



#### **UNIT-II:**

**Natural Disasters**– Hydro meteorological disasters: Causes, impacts, Early warning systems, structural and non-structural measures for floods, drought and cyclones; Tropical cyclones: Overview, cyclogenesis, drought monitoring and management.; Geographical based disasters: Earthquakes and Tsunami- Overview, causes, impacts, zoning, structural and non-structural mitigation measures; Tsunami generation; Landslides and avalanches: Overview, causes, impacts, zoning and mitigation measures. Case studies related to various hydro meteorological and geographical based disasters.

#### **UNIT III:**

**Human induced hazards:** Risks and control measures in a chemical industry, Causes, impacts and mitigation measures for chemical accidents, chemical disaster management, current status and perspectives; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Case studies related to major power break downs, fire accidents and traffic accidents .

#### **UNIT IV:**

**Use of remote sensing and GIS in disaster mitigation and management;** Scope of application of ICST (Information, communication and space technologies in disaster management, Critical applications& Infrastructure; Potential application of Remote sensing and GIS in disaster management and in various disastrous conditions like earthquakes, drought, Floods, landslides etc.

#### **UNIT V:**

**Concept of disaster management:** Introduction to disaster management, Relationship between Risk, vulnerability and a disaster, Disaster management cycle, Principles of disaster mitigation: Hazard identification and vulnerability analysis, Early warning systems and forecasting; Infrastructure and development in disaster management; Disaster management in India: National disaster management framework at central, state, district and local levels. Community based disaster management.

#### **Text Books:**

1. Rajib, S and Krishna Murthy, R.R (2012), "Disaster Management Global Challenges and Local Solutions" Universities Press Hyderabad.
2. Notes / Reading material published by National Disaster Management Institute, Ministry of Home Affairs, Govt. of India.

#### **Suggested Reading:**

1. Navele, P & Raja, C.K. (2009), Earth and Atmospheric Disasters Management, Natural and Manmade. B.S. Publications, Hyderabad.
2. Fearn-Banks, K (2011), Crises computations approach: A case book approach. Route ledge Publishers, Special Indian Education, New York & London.
3. Battacharya, T. (2012), Disaster Science and Management. Tata McGraw Hill Company, New Delhi.

**CE-461**

**GROUND IMPROVEMENT TECHNIQUES  
(Elective - III)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:** To make the students Understand:

1. The importance of ground improvement and learn about various types of ground improvement techniques available to date, and selecting and designing suitable ground improvement technique for given soil conditions.
2. The concepts behind a range of ground improvement and soil remediation techniques.
3. The different concepts of dewatering procedures, soil stabilization, grouting in soils, consolidation and shear strength of the soil.
4. The Types, functions and applications of Geo-textiles, geo-grid, tests on geo-textiles and Reinforced earth.
5. The advantages, disadvantages, and limitations for each ground improvement techniques.
6. The various principles, concepts and methods to improve the strength of soil.

**Course Outcomes:** At the end of the course, would:

1. Know the importance of ground improvement techniques and types of techniques for different soils.
2. Apply the various ground improvement techniques to address the field problems.
3. Understand the degree to which soil properties may be improved; and the benefits involved
4. Identify suitable ground improvement technique for specific project and its implications.
5. Design ground improvement techniques as well as be able to advice regarding value engineering to save cost and obtain maximum benefits for the specific project

**UNIT-I**

**Introduction:** Need for ground improvement, applications, factors affecting - different mechanical, chemical, static and dynamic techniques - mechanical stabilization - blending of aggregate - Rothfunch Testing. Concept of Soil confinement, Gabion Walls, Cirb Walls and Sand Bags.

**UNIT-II**

**Chemical stabilization:** Lime, Cement, Bitumen, factors influencing - Design approach, construction procedure, laboratory testing, additives. Suspension and solution grouts, Principles, method, equipment, applications, compaction grouting, jet grouting.

### **UNIT-III**

**Stabilisation of Cohesion less soils:** In Situ densification, vibro techniques – Mechanisms. Factors affecting, suitability number, compacting piles. Vibro replacement process, Vibro flotation process, Terra Probe Method, Dynamic Compaction, Compaction Files etc.,

### **UNIT-IV**

**Stabilisation of Cohesive soils:** In Situ densification, Pre-loading – Dewatering – sand drains. Sand wicks, geodrains, ropedrains, banddrains-stone columns, lime piles – thermal and vacuum methods

**Treatment of Expansive Soils:** Expansive Soils- parameters of expansive soils and their classification- moisture changes in expansive soils - Design of foundations in expansive soils - CNS technique.

### **UNIT - V**

**In situ Ground treatment for Slopes:** Different types of in-situ soil stabilization like soil nailing, anchoring, pre-stressed anchoring etc - design methods and construction techniques

**Geotextiles :** Woven and non-woven fabrics. Types, functions and applications – Geo-textiles, geo-grids test on geo-textiles. Reinforced earth – Principles and factors governing design.

#### **Text Books :**

1. P.Purushottama Raju, “Ground Improvement Techniques”, Laxmi publications 1999
2. Dr. K.R Arora, “Soil Mechanics and Foundation Engineering”, 5<sup>th</sup> Edition, Standard Publishers, 2005.

#### **Suggested Reading:**

1. Nihar Ranjan Patra, “Ground Improvement Techniques”, Vikas Publishing house Pvt. Ltd, 2012.
2. Hansmann, R., Engineering Principles of Ground Modification, McGraw Hill Publishing Co.
3. Moseley, M.P., Ground Improvement
4. Fang-Hsai – Yang, Foundation Engineering Hand Book, 2<sup>nd</sup> Edition, CBS Publication, New Delhi.
5. Rao, G.V. and Raju, G.V.S.S., Engineering with Geosynthesis

**CE-462**

**ADVANCED REINFORCED CONCRETE DESIGN**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:**

1. To review the fundamental of Limit State Design of Reinforced Concrete Sections as per IS: 456-2000.
2. To make the students to understand the Analysis and Design and Detailing of Curved and Deep Beams.
3. To enable the students understand the behavior of portal frames and their design
4. To introduce the students design principles of Flat Slabs and Grid Slabs
5. To make the students to understand the structural behaviour and design principles of Raft, Pile and Machine foundations.

**Course Outcomes:** Upon the completion of this course, the student should be able to

1. Design the structures by limit state method and thorough with IS456-2000.
2. Analyse and Design suitable curved and deep beams as per the field requirements.
3. Design flat slabs and grid slabs for various loads.
4. Analyse, design and detail the portal frames.
5. Predict structural behaviour of Raft, Pile and Machine foundations and design them.

**UNIT - I**

**Beams curved in plan:** Introduction - Design Principles - Structural Design of beams curved in plan of circular and rectangular types.

**UNIT - II**

**Deep Beams:** Introduction - flexural and shear stresses in deep beams. - I.S. Code provisions - design of Deep beams.

**UNIT - III**

**Portal Frames:** Introduction - Analysis and design of rectangular portal frames for vertical loading including hinges at the base.

**Building Frames:** Substitute frame method of analysis for building frames. Analysis and Design of frames with single bay two storeyed and two bay single storeyed.

**UNIT - IV**

**Flat slabs:** Introduction, Components- I.S. Code Provisions - Design methods, Design for flexure and shear - Openings in Flat slabs.

**Grid Slabs :** Ribbed and Waffle Slabs

## **UNIT - V**

**Raft Foundations:** Definitions, Types - Structural analysis and design of Raft foundation for buildings with column grids up to three by two

**Pile Foundations:** Structural design of Pile and Pile caps

### **Text Books :**

1. N. Krishna Raju, Advanced Reinforced Concrete Design, CBS Publishers, 2016.
2. H.J. Shah, Reinforced Concrete, Charotar Publishers, 2014.

### **Suggested Reading:**

1. P. C. Varghese, Advanced Reinforced Concrete Design, PHI, 2001.
2. Dr. B. C. Punmia, et al, Comprehensive R.C.C. Designs, Laxmi Publishers 1998.



**CE-463 CONSTRUCTION TECHNOLOGY & PROJECT MANAGEMENT  
(Elective - III)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:**

1. The student understands the various steps involved in construction activities, including estimation, scheduling, documentation and maintenance of records.
2. The student learns the concepts of preparatory works to be done and the stages of implementation.
3. The student learns the various methods for excavation in different types of soil.
4. The student learns about the different pile types and to conduct load testing after drilling the piles.
5. To train the students learn the latest techniques in the rapidly changing fields of Construction Engineering, Technology and Management.
6. To prepare the students would be industry leaders who could implement the best engineering and management practices and technologies in the construction industry.

**Course Outcomes:** On successful completion of the programme, the students will,

1. Be able to implement the best engineering and management practices and technologies in the construction industry.
2. Be able to apply theoretical and practical aspects of project management techniques to achieve project goals.
3. Possess organizational and leadership capabilities for effective management of construction projects.
4. Be able to apply knowledge and skills of modern construction practices and techniques.
5. Have necessary knowledge and skills in accounting, financing, risk analysis and contracting.
6. Be capable of using relevant software packages for planning, scheduling, executing and controlling of construction projects.

**UNIT-I**

**Fundamentals of Construction Technology:** Definitions and Discussion - Construction Activities - Construction Processes - Construction Works - Construction Estimating - Construction Schedule - Productivity and Mechanized Construction - Construction Documents - Construction Records - Quality - Safety - Codes and Regulations.

## UNIT-II

**Preparatory Work and Implementation:** Site layout – Infrastructure Development – Construction Methods – Construction Materials – Deployment of Construction Equipment – Prefabrication in Construction – False work and Temporary Works.

## UNIT-III

**Earthwork:** Classification of Soils – Project Site – Development – Setting Out – Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging. Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drillability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting.

## UNIT-IV

**Pile Construction:** Piling – Single pile and a group piles (Bored and Driven) during driving, Working loads and ultimate loads on driven and cast- in-situ piles, Piles in land and marine structures. Construction details of precast piles, pre stressed piles, steel piles and friction piles. Pile Capacity - Load test on piles initial and routine, failure and causes, Methods of pile driving by Vibration and Construction of micro piles, Diaphragm Walls.

## UNIT-V

**Project Management and Tools:** Introduction – Project planning – Scheduling – Controlling – Role of decision in project management – Techniques for analyzing alternatives, Operation research – Methods of planning and programming problems – Development of bar chart - Shortcomings of bar charts- Milestone charts –Planning for network construction – Terminology of net works- Work breakdown structure

### TEXT BOOKS:

1. Subir K.Sarkar and Subhajit Saraswati, Construction Technology Oxford Higher Education- University Press, Delhi.
2. Roy Chudley and Roger Greeno, Construction Technology, Prentice Hall, 2005.

### Suggested Reading:

1. Dr.B.C.Punmia, K.K.Khandelwal, Project Planning and Control with PERT and CPM, Lakshmi Publications New Delhi.
2. Jha, NK, Construction project management, Pearson publications, New Delhi.
3. P.K.JOY Total Project management, the Indian context- Mac Millan Publishers India Limited.

**CE-464**

**BRIDGE ENGINEERING  
(Elective - III)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:**

1. well versed with the codes related to bridge design (IRC,RDSO)
2. effectively carry out designs of super structures of slab and T beam bridges
3. design substructure along with bearings
4. understand the behavior of various bridges
5. know the various bridge construction practices

**Course Outcomes:**

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

1. Design simple bridge structures
2. Easily pickup the nuances of bridge design with the concepts they are imparted in the course
3. Work in the bridge construction site with ease
4. Read the drawings , understand them and implement the in the site
5. Bring his concepts to the fore in the times of structural crisis in the bridge site

**UNIT - I**

**Introduction:** Types of bridges, materials of construction, codes of practice (Railway and Highway Bridges), aesthetics, loading standards, (IRC, RDSO, AASHTO), recent developments box girder bridges, historical bridges (in India and Overseas),Planning and layout of bridges, hydraulic design, geological and geo-technical considerations, Design aids, computer software, expert systems.

**UNIT - II**

**Concrete Bridges:** Bridge deck and approach slabs, design of bridge deck systems, slab - beam systems (Guyon - Massonet and Hendry Jaeger Methods), box girder systems, analysis and design.

**UNIT - III**

**Steel and Composite Bridges:** Orthotropic decks, box girders, composite steel - concrete bridges, analysis and design, truss bridges.

**UNIT - IV**

**Sub - Structure:** Piers, columns and towers, analysis and design, shallow and deep foundations, caissons, abutments and retaining walls.

**Bridge appurtenances:** Expansion joints, design of joints, types and functions of bearings, design of elastometer bearings, railings, drainage system, lighting.

## **UNIT - V**

**Long span bridges:** Design principles of continuous box girders, curved and skew bridges, cable stayed and suspension bridges, seismic resistant design, seismic isolation and damping devices Construction techniques (cast in-situ, prefabricated, incremental launching, free cantilever construction), inspection, maintenance and rehabilitation, current design and construction practices.

### **Text Books:**

1. N. Krishna Raju, Design of Bridges, 4th Edition, 2008
2. Essentials of Bridge Engineering By Johnson Victor, Oxford & IBH, 6th Edition, 1973

### **Suggested Reading:**

1. Design of Concrete Bridges, by Raina, 2004.
2. "Bridge Engineering Handbook", Wai-Fah Chen Lian Duan, CRC Press, USA, 2000
3. "Design of Highway Bridges", Barker, R.M. and Puckett, J.A., John Wiley & Sons, New York, 1997
4. "Theory and Design of Bridges", Xanthakos, P.P., John Wiley & Sons, New York, 1994

**CE-465 SERVICES, MAINTENANCE AND REPAIR OF BUILDINGS  
(Elective - III)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:** To enable the student to:

1. Understand various types of building services, their layouts and their aspects of inspection, maintenance and repair.
2. Learn the concepts of inspection & maintenance of buildings and preparation of annual maintenance budget
3. Gain the knowledge of various repair methods for masonry and concrete buildings
4. Know the various repair methods related to Steel structures
5. Learn the concepts of various Composite structures and methods of their repair
6. Select an appropriate repair method for a given building in a given situation

**Course Outcomes:** At the end of the course, student should be able to:

1. Prepare layouts of various building services, prepare schedules of their inspection, prepare schedules of need based repair and maintenance.
2. Identify the repair and maintenance needs of masonry and concrete buildings
3. specify the repair and maintenance needs of steel buildings
4. estimate the repair and maintenance needs of composite buildings
5. suggest suitable repair technique for a given building in a given situation
6. excel as a good professional building service engineer.

**UNIT- I**

**Services:** Water supply and Sanitary systems – Inspection , maintenance and repair aspects- ; Electrical installations – improving the illumination of a room ; Non conventional energy systems – Solar power – Bio- gas; Acoustics for buildings ; Lightening arrestors ; Air- conditioning systems ; Lifts and escalators – operational and maintenance aspects – Statutory examinations.

**UNIT- II**

**Inspection and Maintenance of Buildings:** Purpose of Inspection of Buildings – Visual Inspection , Rapid Visual Inspection and NDT – Damage detection in buildings – Causes of Distress in Structures ; Normal and routine maintenance aspects in a building – Classification of maintenance works – Annual budgetary provision ; Determination of approximate age and strength of an old building.

**UNIT-III**

**Repairs to Masonry and Concrete Structures:** Method of crack repair in masonry and concrete structures grouting and sealing of cracks, reinforcement repair, anchorage, bonding repair materials to existing concrete, material placement methods ; Shotcreting and guniting, grouting-Portland cement grouting, chemical grouting, dry packing, polymer impregnation, strengthening of structures : Techniques

#### **UNIT- IV**

**Repairs to Steel Structures:** Testing of structural steel, lamination, dynamic loading and fatigue , welding technology, weld ability, replacement and addition of new members , different types of steel and concrete joints

#### **UNIT- V**

**Repair of Composite Structures:** Design consideration, flexural strengthening, shear strengthening, strengthening of columns – jacketing of columns, strengthening by interior and external reinforcing , External pre-stressing , fiber wrapping, corrosion protection: surface treatment, joint sealants, cathodic protection, removal and replacement techniques of structural members.

#### Text Books:

1. P.C. Guha “Maintenance and Repair of Buildings”, New Central Book Agency, Kolkata, 2006.
2. CPWD “Handbook on Repair and Rehabilitation of RC Buildings”, Director General of CPWD, New Delhi, 2002.
3. Den Campbell, Allen and Harold Roper, “Concrete Structures Materials, Maintenance and Repair”, Longman Scientific and Technical, UK, 1991.

#### Suggested Reading:

1. Allen R.T and Edwards S.C, “Repair of Concrete Structures”, Blackie and sons, UK, 1987.
2. Philip H.Perkins “Repair, Protection and waterproofing of Concrete Structures”, Elsevier Applied Science Publisher, London, Newyork, 1986.

**ME-414**

**OPERATIONS RESEARCH  
(Elective - III)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course objectives:**

1. To understand the significance of Operations Research concept and techniques
2. To know the formulation of LPP models
3. To understand the Algorithms of Graphical and Simplex Methods
4. To understand the Transportation and Assignment techniques
5. To know the procedure of Project Management along with CPM and PERT techniques
6. To understand the concepts of sequencing and queuing theory

**Course Outcomes:** At the end of the course, the student

1. Recognizes the importance and value of Operations Research and mathematical formulation in solving practical problems in industry
2. Formulate a managerial decision problem into a mathematical model
3. Understand Operations Research models and apply them to real-life problems  
Build and solve Transportation Models and Assignment Models
4. Apply project management techniques like CPM and PERT to plan and execute project successfully
5. Understand and apply sequencing and queuing theory concepts in industry applications

**UNIT-I**

**Introduction:** Definition and Scope of Operations Research.

**Linear Programming:** Introduction, Formulation of linear programming problems, graphical method of solving LP problem, simplex method, Degeneracy in Simplex, Duality in Simplex.

**UNIT-II**

**Transportation Models:** Finding an initial feasible solution - North West Corner Method, Least Cost Method, Vogel's Approximation Method, Finding the optimal solution, Special cases in Transportation problems - Unbalanced Transportation problem, Degeneracy in Transportation, Profit Maximization in Transportation.

**UNIT-III**

**Assignment Problems:** Introduction, Hungarian technique of Assignment problems, unbalanced problems, problems with restrictions, Maximization in Assignment problems.

Travelling salesman problem

**UNIT-IV:**

**Project Management:** Definition, Procedure and Objectives of Project Management, Differences between PERT and CPM, Rules for drawing Network diagram, Scheduling the activities, Fulkerson's rule, Earliest and Latest times, Determination of ES and EF times in forward path, LS & LF times in backward path, Determination of critical path, duration of the project, Free float, Independent float and Total float. Crashing of network.

**UNIT-V**

**Sequencing Models:** Introduction, General assumptions, processing 'n' jobs through 2 machines, processing 'n' jobs through 3 machines.

**Queuing Theory:** Introduction, Kendal's Notation, single channel - poisson arrivals - exponential service times

**Text Books:**

1. Operation Research by Hamdy.A.Taha
2. Operation Research by Wagner

**Reference Books:-**

1. Operation Research by JK Sharma
2. Operation Research by V.K.Kapoor
3. Operation Research by Kanti Swaroop
4. Operation Research by Manmohan Singh



**CE-466**

**URBAN AND RURAL PLANNING**

**(Elective - IV)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:**

1. Understand the process of integrated planning of facilities for rural areas
2. Know the various aspects involved in urban land use planning
3. Gain knowledge of best use of resources for a town
4. Formulate applicable rules for town planning and prepare check lists for approvals
5. Learn the concepts of land use and Zoning in towns
6. Understand the importance of the steps involved in preparing a master plan for a town

**Course Outcomes:** At the end of the course, the student

1. Will be able to provide a plan for basic facilities for rural areas
2. Can prepare models for urban land use patterns
3. Can apply the basic principles and practices involved in town planning
4. Have knowledge of preparation of necessary documents for regularization of buildings and land development
5. Will be able to identify the applicable government regulations and zoning restrictions
6. Can prepare a Master Plan for a town including objectives, purposes, process & performance evaluation

**UNIT-I Rural planning**

**Integrated planning of rural areas :** Decentralized planning, Participatory planning, District planning.

**73rd constitutional amendment act - 1993:** Salient programmes of state / Central government, Agriculture, Land, Irrigation and water management, social forestry and minor forest products, Small scale/village/cottage industries, Rural housing, Drinking water, Rural roads, Rural electrification and non conventional energy sources, panchayat raj, Issues approach and process, Implimentation.

**UNIT-II Urban planning**

**Landuse patterns:** Grid system, Radial or star system

**UNIT-III Principles of Town planning**

**Planning principles**

**Detail survey of area:** Topographical survey, Forms of topographic data, Raw survey data, Remote sensing data, Topographic mapping, Digital elevation modeling, Topological modeling

**Traffic survey:** Transport planning, Low & high density, Efficient transportation for

sustainable development, Traffic management

**Water resources survey:** Clean watersheds, topographic maps, planning water resources

**Population surveys(census)**

**Environmental planning**

#### **UNIT-IV Functions of Town Planning**

Functions and applicable rules, Check list for approvals, Land development, Regularization schemes, Master plan (objectives, purposes, process & performance evaluation)

#### **UNIT-V Concepts of Town planning**

**Concept of planning:** Zoning concept, Zoning.

**land use and Zoning Basics :** Zoning regulations (6 major use zones ) , regulation of development, Limits on zoning regulation, Challenges to zoning regulations, Non government restrictions, land use and Zoning practices, Zoning laws and land use, Challenging Zoning regulations

#### **Satellite town concept and Metropolitan Areas Garden city concept**

##### **Text Books:**

1. "Introduction to Architecture and Town Planning with Vastu shastra" by: R.P.Singh Kushwah.
2. Architecture and Town planning by Satish Chandra Agrawal
3. Fundamentals of Town Planning by GK Hiraskar

##### **Suggested Reading:**

1. Social Town Planning by Clara, H Greed
2. Planning and Development of Towns by R.C.Gupta
3. Urbanization and Urban Systems in India by R.Ramachandran.
4. Indian Metropolis: Urbanization, Planning and Management by Bawa. V.K

**CE-466**

**TRANSPORTATION PLANNING  
(Elective - IV)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course objectives:**

1. To understand the importance and the steps involved of transportation planning.
2. To identify the data required for creating and improving transportation infrastructure
3. To get knowledge about the traffic data acquisition process and analyzing for understanding traffic growth pattern.
4. To understand the concepts of modeling techniques applied in transportation planning.

**Course outcomes:**

1. To apply the fundamental knowledge for creating the transportation infrastructure facilities scientifically and ethically.
2. To understand the travel pattern behavior of various people
3. To apply the computer knowledge in solving the transportation planning related problems
4. To select the transportation related plans economically and ethically.

**UNIT I**

Introduction of concepts of Transportation planning process, Interdependence of the land use and traffic, systems approach to transportation planning, stages in transportation planning, survey and analysis of existing conditions, forecast analysis of future conditions and plan synthesis, evaluation, program adoption and implementation,

**UNIT II**

Transportation Surveys - Introduction, definition of the study area, zoning, types of surveys, home interview, commercial vehicle, taxis, road side interview, post card questionnaire, registration number of vehicle plate, tags on vehicles, mass transport, analyzing the data from samples,

**UNIT III**

Trip Generation - Introduction and definition, trip purpose, factors governing trip generation and attraction rates, regression methods - multiple linear regression analysis.

Trip Distribution - concepts of trip distribution, methods of trip distribution, uniform (constant) factor method, average factor method, fratar method, furness method, advantages and disadvantages of growth factor methods, the gravity model.

#### **UNIT IV**

Traffic Assignment – purpose of traffic assignment, general principles, assignment techniques, all or nothing assignment, multiple route assignment, capacity restraint assignment, diversion curves.

Modal split – General considerations, factors affecting modal split, modal split in the transportation planning process.

#### **UNIT V**

Economic evaluation of transportation plans – need for economic evaluation, costs and benefits of transportation projects, basics principles of economic evaluation, Methods of economic evaluation, comparison of various methods Computer applications in Transportation planning.

#### **Text books:**

1. Hutchinson B. G. “Principles of Urban Transport systems Planning”, scripta McGraw -Hill, Newyork, 1974.
2. Papacostas C.S. Prevedouros P.D. “Transportation Engineering & Planning”, PHI New Delhi.

#### **Suggested Reading:**

1. L.R. Kadiyali “Traffic Engineering and Transportation Planning” Khanna Publishers
2. SARKAR, PRADIP KUMAR, MAITRI, VINAY, JOSHI, G.J. “Transport Planning : Principles, Practice and Policies” PHI Eastern Economy Edition

**CE-468 SUSTAINABLE DEVELOPMENT AND VALUE ENGINEERING  
(Elective - IV)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:** To make the Student

1. Understand the significance of Energy systems, climate change and Impact
2. Understand the concepts of sustainability, alternative construction materials etc.
3. Acquire knowledge about recycling and reuse of materials, various decomposing methods.
4. Understand meaning of value, life cycle cost etc.

**Course Outcomes:** At the end of the course, student should be able to:

1. Successfully apply the knowledge of various energy systems to his professional life
2. Apply technical skills and knowledge of sustainability for solving construction problems
3. Apply the knowledge of reuse and recycling methods successfully in practical related problem.
4. Can apply the knowledge of value analysis and attain optimized solutions
5. Can apply the knowledge of cost analysis, and minimize project cost and time.

### UNIT I

**Concepts of sustainability :** Energy and Global environment, Energy use and Climate change - Its impact, Types of Energy systems, Concept of Sustainability - Principles of conservation - synergy with nature, Bioregionalism - community basis shelter technology within bioregional patterns and scales, Ethical-environmental degradation.

### UNIT II

**Sustainable Building Materials and Construction :** Properties, Uses and Examples of -Primary, secondary and Tertiary Sustainable Materials, Principles to improve the energy efficiency - siting and vernacular design, shade, ventilation, earth, shelter, thermal inertia and air lock entrances. Techniques of sustainable construction - technologies, methods of effectiveness, and design synthesis - Green buildings - alternative materials and construction methods: solar water heating panels; photovoltaic electricity generation; use of local materials and on site growth of food, fuel and building materials.

### UNIT III

**Recycling and Reuse :** Pre building, Building, Post building stages - Architectural Reuse, Waste prevention, Construction and Demolition recycling- Conservation of natural and building resources- Energy and material savings - types of wastes -

Elimination of waste and minimize pollution- various Decomposing methods - Innovative reuse of various wastes.

#### **UNIT IV**

##### **Value Analysis**

**Value** : Meaning of value, basic and secondary functions, factor contributing to value such as aesthetic, ergonomic, technical, economic , identifying reasons or unnecessary costs . Value Analysis : 10 Commandments of value analysis; value analysis team; principles of value analysis, elements of a job plan viz. orientation, Information, presentation. Implementation, follow up action, benefits of value analysis, various applications; assessing effectiveness of value analysis.

#### **UNIT V**

**Life cycle costing:**Life cycle costing – Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, sensitivity analysis. Different methods of performing value engineering.

##### **Text Books:**

1. B.C.Bose, “Integrated approach to sustainable Development”, Rajat Publications, Delhi, 2001.
2. Value Engineering: Analysis And Methodology By Del Younker, 2003.

##### **Suggested Reading:**

1. Laurie Baker’s, “Chamoli Earthquake hand book”, Cost ford, Centre of science and technology for rural development,2007.
2. Fuller Moore, “Environmental control systems Heating, Cooling, Lighting”. McGraw Hill, Newyork, 1992.
3. Caring A.Langston, Grace K.C.Ding, “Sustainable practices in built environment”, second edition, Butterworth-Heinmann Linacre House Jordan hill Oxford,2013.
4. R.N.Trivedi, “Environmental Sciences”, Anmol Publications Pvt Ltd, New Delhi, 2002.

CE-469

**WATER SHED MANAGEMENT****(Elective - IV)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:**

1. To equip the students with the concept of watershed management and understand the socio economic aspects related to watershed development.
2. Enable the students to understand the characteristics of various watershed parameters.
3. Enable the students to learn the principles of soil erosion and various controlling techniques to check soil erosion.
4. Equip the students with the knowledge of various water harvesting techniques and land use/land cover management practices.
5. To enable the students to plan and design soil and water conservation measures in a watershed.
6. To enable the students to understand the concept of integrated watershed management and ecosystem management.

**Course outcomes:** At the end of the course the student will be able to

1. Calculate watershed parameters and analyze watershed characteristics to take appropriate management action.
2. Quantify soil erosion and design control measures.
3. Apply land grading techniques for proper land management.
4. Implement collection and storage of water through rainwater harvesting for sustainable development in the perspective of increasing population and changing life styles of the society
5. Suggest suitable harvesting techniques for better watershed management.
6. Apply fundamental concepts of water and land resources management to solve water shortage problems.

**UNIT - I**

**Definition and concept of Watershed:** Concept of watershed development, History of Watershed management and its relevance to India, objectives of watershed development, different stake holders & their relative importance, need for watershed development in India,

Selection of watershed issues for watershed policies, Integrated and multidisciplinary approach for watershed management.

**UNIT - II**

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

**Principles of Erosion:** Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion

**Measures to Control Erosion:** Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.

### UNIT - III

**Water Harvesting:** Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks. Roof catchments harvesting.

**Land Management:** Land use and land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

### UNIT - IV

#### **Social Aspects of Watershed Management:**

Planning of Water shed management activities, community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies.

### UNIT - V

#### **Integrated Watershed Management:**

Introduction to integrated approach, Integrated water resources management, conjunctive use of water resources.

**Ecosystem Management:** Role of Ecosystem, crop husbandry, soil enrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, horticulture, social forestry and afforestation.

#### **Text Books:**

1. Murthy, J.V.S. (1998). "Watershed Management." New Age International (P), Ltd., New Delhi,
2. Majumdar, D.K. (2000). "Irrigation and Water Management." Prentice Hall, New Delhi.

#### **Suggested Reading:**

1. Mohan Das, M. and Das Saikia, M. (2013). "Watershed Management." PHI Learning (P)., Ltd., New Delhi.
2. Goswami, M.D. (2004). "Watershed Management: Theory and Practices." Ritwik and Gargee (P)., Guwahati, Assam.
3. Haan, C.T., Johnson, C.T., AND Brakensiek, D.L. (1982). "Hydrologic Modeling of Small Watersheds." ASAE, Michigan, 1982.
4. K.Srinivasa Raju and D.Nagesh Kumar (2014) Multicriterion Analysis in Engineering and Management, Prentice Hall of India (PHI) Learning Pvt. Ltd, New Delhi, ISBN 978-81-203-3976-7, pp.288.



With Effect from the Academic Year 2016 - 2017

ME 472

**Intellectual Property Rights (Elective - III)**

(for Mech, Prod, Civil, ECE, EEE, CSE, IT)

Instruction	4	Periods per week
Duration of End Examination	3	Hours
End examination	75	Marks
Sessionals	25	Marks
Credits	3	

**Objectives:**

1. To introduce fundamental aspects of IP
2. Introducing all aspects of IPR acts.
3. Creating awareness of multi disciplinary audience
4. Creating awareness for innovation and its importance
5. Exposing to the changes in IPR culture
6. Awareness about techno-business aspects of IPR

**Outcomes:** At the end of the course, a student

1. Will respect intellectual property of others
2. Learn the art of understanding IPR
3. Develop the capability of searching the stage of innovations.
4. Capable of filing a patent document independently.
5. Completely understand the techno-legal business angle of IP. .
6. Capable of converting creativity into IP and effectively protect it.

**UNIT-I**

**Overview of Intellectual Property:** Introduction and the need for intellectual property right (IPR), IPR in India - Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT

**Patents:** Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensors of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

**UNIT-II**

**Industrial Designs:** What is an industrial design. How can industrial designs be protected, What kind of protection is provided by industrial designs? How long does the protection last, Why protect industrial designs.

**UNIT-III**

**Trademarks:** What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered. How long is a registered trademark protected for. How extensive is trademark protection. What are well-known marks and how are they protected. Domain name and how does it relate to trademarks. Trademark infringement and passing off.

#### **UNIT-IV**

**Copyright:** What is copyright. What is covered by copyright. How long does copyright last, Why protect copyright. Related Rights: what are related rights. Distinction between related rights and copyright. Rights covered by copyright. Copy rights in computer programming.

#### **UNIT-V**

**Enforcement of Intellectual Property Rights:** Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property protection. Case studies of patents and IP Protection.

**Unfair Competition:** What is unfair competition. Relationship between unfair competition and intellectual property laws.

#### **Text Books:**

1. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
2. B. L.Wadehra; Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi 2010

#### **Suggested Reading:**

1. Cronish W.R1 Intellectual Property; Patents, copyright, Trad and Allied rights, Sweet & Maxwell, 1993.
2. P. Narayanan, Intellectual Property Law, Eastern Law Edn., 1997.
3. Robin Jacob and Daniel Alexander, A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs, Sweet, Maxwell 4<sup>th</sup> Edition.

CS 485

**INFORMATION SECURITY**  
**(Common to all Branches except CSE)**

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks
Credits	3

**Course Objectives:**

1. Understand security concepts, Ethics and laws in information Security.
2. Understand security threats, and the security services and mechanisms to counter them.
3. Comprehend and apply relevant cryptographic techniques, different levels of security professionals.
4. Understand the internal and external vulnerabilities, firewall and intruder techniques.
5. Comprehend and apply authentication services and mechanisms.

**Course Outcomes:**

After studying this course, you should be able to:

1. Identify information security threats and their risk.
2. Understand the basic concepts, goals and life cycle of Information security
3. Understand the legal privacy and ethical issues and laws in information security.
4. Determine firewall requirements, and configure a firewall and Intruder concept.
5. Identify both external and internal vulnerabilities to enterprise computer infrastructures and sensitive digital assets and devise a mitigation plan against them.
6. Understand the classical cryptosystems and techniques used to break them.

**UNIT-I**

**Introduction:** History, critical characteristics of information, NISTISSC security model, Components of an information system, Securing the components, balancing security and access, The SDLC, The security SDLC.

**Need for Security:** Business needs, Threats, Attacks-secure software development

**UNIT-II**

**Legal, Ethical and Professional Issues:** Law and ethics in information security, relevant U.S laws-international laws and legal bodies, Ethics and information security.

**Risk Management:** Overview, Risk Identification, risk assessment, Risk Control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, recommended risk control practices.

### **UNIT-III**

**Planning for Security:** Security policy, Standards and practices, Security blue print, Security education, Continuity strategies.

**Security Technology:** Firewalls and VPNs: Physical design, firewalls, protecting remote connections.

### **UNIT-IV**

**Security Technology:** Intrusion detection, Access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

**Cryptography:** Foundations of cryptology, cipher methods, Cryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems.

### **UNIT-V**

**Implementing Information Security:** information security project management, technical topics of implementation , Non- technical aspects of implementation, Security certification and accreditation

**Security and Personnel:** Positioning and staffing security function, Employment policies and practices, internal control strategies.

**Information security Maintenance:** Security management models. The maintenance model, Digital forensics

### **TEXT BOOKS:**

1. Michael E. Whitman and Hebert J Mattord, "Principles of Information Security, 4th edition", Ed. Cengage Learning 2011.
2. Thomas R Peltier, JustingPeltier, John Blackley, "Information Security. Fundamentals", Auerbacj Publications 2010.

### **SUGGESTING READINGS:**

1. Detmar W Straub, Seymor Goodman, Richard L Baskerville, "Information Security. Policy processes and practices", PHI 2008.
2. MarksMerkow and Jim Breithaupt, "Information Security. Principle and Practices", Pearson Education, 2007.

**CE-423**

**Seminar**

Instruction	3 Periods per week
Sessional	25 Marks
Credits	1

**Course Objectives:** To make the Student

**Course Outcomes:** At the end of the course, student should be able to:

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.

Seminar topics may be chosen by the students with advice from the faculty members. Students are exposed to the following aspects of a seminar presentation

1. Literature survey
2. Organization of the material
3. Power Point presentation
4. Technical writing

Each student is required to:

1. Submit a one page synopsis before the seminar talk for display the notice board.
2. Give a 20 minutes presentation through OHP, PC, slide projector, followed by a 10 minutes discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled the 3<sup>rd</sup> week to the last week of the semester and any change in schedule should be discouraged.

For award of sessional marks students are to be judged by at least two faculty members on the basis of an oral and a written presentation as well as their involvement in the discussions.

**CE-424****PROJECT**

Instruction	6 periods per week
University Examination	Viva-voce
University Examination	100 Marks
Sessional	50 Marks
Credits	9

Dealing with a real time problem should be the focus of under graduate project.

All projects will be monitored at least four times in the II-semester through individual presentations (Project batch wise).

Every student should maintain a project dairy, wherein he/she needs to record the progress of his/her work and get it signed at least once in a week by the guide(s). If working outside and college campus, both the external and internal guides should sign the same.

Problems can also be invited from the industries to be worked out through undergraduate projects. Efforts may be made such that the projects may be carried out in reputed industries/ research organizations/PSUs.

Sessional marks should be based on the marks, awarded by a monitoring project committee of faculty members as well as the marks given by the guide.

Common norms should be established for final documentation of the project report by the respective department on the following lines:

1. The project title should be task oriented for example "Analysis and Modeling of ....."
2. Objectives of the project should be identified clearly and each student of the project batch should fulfill at least one of the objectives identified. The chapters of the project report should reflect the objectives achieved.
3. Contents of the report should include the following
  - a. Title page
  - b. Certificate
  - c. Acknowledgements
  - d. Abstract (limited to one/two paragraphs, page no.1 should start from this)
  - e. Contents (Ch. No.            Title of the chapter/section Page No.)
  - f. List figures (Fig. No.        caption of the figure        Page No.)

- g. List of Tables (Table. No.      Caption of the table    Page No.)
  - h. List of Symbols (ex. C:            Velocity of light  $3 \times 10^8$  m/s )
  - i. Chapter I should be introduction . This should contain sections as objectives of the project, technical approach, literature survey, the importance of the project and organization of the report.
  - j. The remaining chapters should include regarding the implementation of the project, results with discussions and conclusions. Students are expected to write about future scope of the project.
  - k. References should be indicated as per IEEE or standard format, which should be duly referred in the report.
  - l. The algorithms related to the software developed should be thoroughly discussed in Appendices  
etc..
4. The project reports should be hard bound.

The project report should be evaluated for 100 Marks by the External Examiner.

The project work, if found inadequate in the external examination, the candidate should repeat the project work with a new problem or improve the quality of work and report it again.