B.E:CIVIL ENGINEERING

TOTAL CREDITS: 185

SEMESTER - I

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13H101	TECHNICAL ENGLISH I	3	0	0	3	40	60	100	HUM
13H102	LINEAR ALGEBRA, CALCULUS AND APPLICATIONS	3	1	0	4	40	60	100	BS
13H103	ENGINEERING PHYSICS	3	0	0	3	40	60	100	BS
13C104	ENGINEERING CHEMISTRY FOR CIVIL ENGINEERING	3	0	0	3	40	60	100	BS
13H105	FUNDAMENTALS OF COMPUTING AND C PROGRAMMING	4	0	0	4	40	60	100	EAS
13C106	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	4	0	0	4	40	60	100	EAS
PRACTICAL									
13H111	FUNDAMENTALS OF COMPUTING AND C PROGRAMMING LABORATORY	0	0	3	1	60	40	100	EAS
13J113	ENGINEERING PRACTICES	0	0	3	1	60	40	100	EAS
13H211	PHYSICS/CHEMISTRY LABORATORY *	0	0	3	Refer SemII & footnote #				BS
Total		**20**	**1**	**9**	**23**				

SEMESTER - II

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13H201	TECHNICAL ENGLISH II	3	0	0	3	40	60	100	HUM
13H202	TRANSFORM TECHNIQUES AND INTEGRAL CALCULUS	3	1	0	4	40	60	100	BS
13C203	MATERIALS SCIENCE FOR CIVIL ENGINEERING	3	0	0	3	40	60	100	BS
13H204	ENVIRONMENTAL SCIENCE	3	0	0	3	40	60	100	BS
13C205	ENGINEERING MECHANICS	3	1	0	4	40	60	100	EAS
13C206	BASICS OF CIVIL AND MECHANICAL ENGINEERING	4	0	0	4	40	60	100	EAS
PRACTICAL									
13H211	PHYSICS/CHEMISTRY LABORATORY*	0	0	3	2	60	40	100	BS
13K212	ENGINEERING GRAPHICS	1	-	3	2	60	40	100	EAS
13C213	UNIX AND ADVANCED C-PROGRAMMING LABORATORY	0	0	3	1	60	40	100	EAS
Total		**20**	**2**	**9**	**26**				

SEMESTER - III

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13C301	FOURIER ANALYSIS AND MATHEMATICAL STATISTICS	3	1	0	4	40	60	100	BS
13C302	APPLIED GEOLOGY AND ENGINEERING MATERIALS	3	0	0	3	40	60	100	DC
13C303	MECHANICS OF SOLIDS I	3	1	0	4	40	60	100	DC
13C304	MECHANICS OF FLUIDS	3	1	0	4	40	60	100	DC
13C305	CONSTRUCTION TECHNOLOGY	3	0	0	3	40	60	100	DC
13C306	SURVEYING -I	3	0	0	3	40	60	100	DC
PRACTICAL									
13C311	CONSTRUCTION MATERIALS LABORATORY	0	0	3	1	60	40	100	DC
13C312	STRENGTH OF MATERIALS LABORATORY	0	0	3	1	60	40	100	DC
13C313	SURVEY PRACTICES-I	0	0	3	1	60	40	100	DC
Total		**18**	**3**	**9**	**24**				

SEMESTER - IV

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13C401	NUMERICAL METHODS	3	1	0	4	40	60	100	BS
13C402	ENVIRONMENTAL ENGINEERING-I	3	0	0	3	40	60	100	DC
13C403	MECHANICS OF SOLIDS II	3	1	0	4	40	60	100	DC
13C404	APPLIED HYDRAULIC ENGINEERING	3	1	0	4	40	60	100	DC
13C405	SURVEYING-II	3	0	0	3	40	60	100	DC
13C406	BASIC STRUCTURAL DESIGN	3	1	0	4	40	60	100	DC
PRACTICAL									
13C411	HYDRAULIC ENGINEERING LABORATORY	0	0	3	1	60	40	100	DC
13C412	SURVEY PRACTICES-II	0	0	3	1	60	40	100	DC
13C413	COMPUTER AIDED BUILDING DRAWING	0	0	6	2	60	40	100	DC
Total		**18**	**4**	**12**	**26**				

B.E:CIVIL ENGINEERING

SEMESTER - V

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13C501	GEOTECHNICAL ENGINEERING - I	3	1	0	4	40	60	100	DC
13C502	CONSTRUCTION MANAGEMENT	3	0	0	3	40	60	100	DC
13C503	STRUCTURAL ANALYSIS –I	3	1	0	4	40	60	100	DC
13C504	DESIGN OF STEEL STRUCTURES	3	1	0	4	40	60	100	DC
13C505	ENVIRONMENTAL ENGINEERING-II	3	0	0	3	40	60	100	DC
13C506	TRANSPORTATION ENGINEERING -I	3	0	0	3	40	60	100	DC
PRACTICAL									
13C511	ENVIRONMENTAL ENGINEERING LABORATORY	0	0	3	1	60	40	100	DC
13J512	COMMUNICATION SKILLS LABORATORY	1	0	3	2	-	100	100	HUM
13C513	GEOTECHNICAL ENGINEERING LABORATORY	0	0	3	1	60	40	100	DC
Total		**19**	**3**	**9**	**25**				

SEMESTER - VI

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13C601	CONCRETE TECHNOLOGY	3	0	0	3	40	60	100	DC
13C602	GEOTECHNICAL ENGINEERING – II	3	1	0	4	40	60	100	DC
13C603	STRUCTURAL ANALYSIS – II	3	1	0	4	40	60	100	DC
13C604	TRANSPORTATION ENGINEERING-II	3	0	0	3	40	60	100	DC
13C605	DESIGN OF RC ELEMENTS	3	1	0	4	40	60	100	DC
13CXXX	ELECTIVE -I	3	0	0	3	40	60	100	DE
PRACTICAL									
13C611	COMPUTER AIDED DESIGN AND DRAFTING LABORATORY	0	0	6	2	60	40	100	DC
13C612	CONCRETE AND HIGHWAY LABORATORY	0	0	6	2	60	40	100	DC
Total		**18**	**3**	**12**	**25**				

B.E:CIVIL ENGINEERING

SEMESTER - VII

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13C701	DESIGN OF REINFORCED CONCRETE STRUCTURES	3	1	0	4	40	60	100	DC
13C702	GEOGRAPHICAL INFORMATION SYSTEM	3	0	0	3	40	60	100	DC
13C703	SEISMIC DESIGN OF STRUCTURES	3	0	0	3	40	60	100	DC
13C704	IRRIGATION ENGINEERING	3	0	0	3	40	60	100	DC
13CXXX	ELECTIVE II	3	0	0	3	40	60	100	DE
13CXXX	ELECTIVE III	3	0	0	3	40	60	100	DE
PRACTICAL									
13C711	ESTIMATION AND COSTING	0	0	6	2	60	40	100	DC
13C721	COMPREHENSIVE VIVA-VOCE	0	0	0	1	60	40	100	DC
13C751	PROJECT WORK - PHASE I	0	0	3	1	60	40	100	DC
Total		**18**	**1**	**9**	**23**				

SEMESTER - VIII

Course Code	Course Title	Hours / week			C	Maximum Marks			CAT
		L	T	P		CA	SEE	Total	
THEORY									
13CXXX	ELECTIVE IV	3	0	0	3	40	60	100	DE
13CXXX	ELECTIVE V	3	0	0	3	40	60	100	DE
PRACTICAL									
13C831	INPLANT TRAINING**	0	0	0	1	-	100	100	DC
13C851	PROJECT WORK – PHASE II	0	0	18	6	60	40	100	DC
Total		**6**	**0**	**18**	**13**				

L - Lecture
T - Tutorial
P - Practical
C - Credits
CA - Continuous Assessment
SEE - Semester End Examination
BS - Basic Science
HUM - Humanities
DC - Department Core
CAT - Category
EAS - Engg Arts & Science
DE - Department Elective

\# - Continuous assessment marks are awarded for performance in both semesters I and II as given in section 13 supra. Semester End Examination is in second semester only.

* - Laboratory classes for physics and chemistry are held in alternate weeks

** - The student has to spend 20 days in the industry during vacation at the end of the VII semester

B.E:CIVIL ENGINEERING

LIST OF ELECTIVES

Course Code	Course Title
	STRCUTURAL ENGINEERING
13C001	SMART MATERIALS AND STRUCTURES
13C002	BRIDGE ENGINEERING
13C003	STORAGE STRUCTURES
13C004	DESIGN OF PLATES AND SHELL STRUCTURES
13C005	TALL BUILDINGS
13C006	PREFABRICATED STRUCTURES
13C007	WIND ENGINEERING
13C008	COMPUTER AIDED DESIGN OF STRUCTURES
13C009	INDUSTRIAL STRUCTURES
13C010	MODERN CONSTRUCTION MATERIALS
13C011	FINITE ELEMENT TECHNIQUES
13C012	REPAIR AND REHABILITATION OF STRUCTURES
13C013	OPTIMIZATION IN ENGINEERING
	ENVIRONMENTAL ENGINEERING
13C021	INDUSTRIAL WASTEWATER MANAGEMENT
13C022	AIR AND WATER QUALITY MODELLING
13C023	ENVIRONMENTAL IMPACT ASSESSMENT OF CIVIL ENGINEERING PROJECTS
13C024	AIR POLLUTION AND CONTROL
13C025	SOLID WASTE MANAGEMENT
13C026	INDUSTRIAL WASTE MANAGEMENT
13C027	HAZARDOUS WASTE MANAGEMENT
	GEOTECHNICAL ENGINEERING
13C035	GROUND IMPROVEMENT TECHNIQUES
13C036	ROCK ENGINEERING
13C037	DESIGN OF SUBSTRUCTURES
13C038	GEOTECHNICAL EARTHQUAKE ENGINEERING
	WATER RESOURCES ENGINEERING
13C045	REMOTE SENSING TECHNIQUES AND APPLICATIONS
13C046	GROUND WATER ENGINEERING
13C047	HYDROLOGY
13C048	WATER RESOURCES ENGINEERING
	TRANSPORTATION ENGINEERING
13C055	PAVEMENT ENGINEERING
13C056	TRAFFIC ENGINEERING AND MANAGEMENT
	MANAGEMENT
13C065	COASTAL ZONE MANAGEMENT
13C066	DISASTER MANAGEMENT AND MITIGATION
	TOWN PLANNING
13C070	HOUSING PLANNING AND MANAGEMENT
13C071	ARCHITECTURE AND TOWN PLANNING

B.E:CIVIL ENGINEERING

ELECTIVES

13C001 SMART MATERIALS AND STRUCTURES 3 0 0 3

OBJECTIVES

- To study the latest developments regarding smart materials and their use in structures.
- To study the concepts of structures which can self adjust their stiffness with load.

OUTCOMES

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

- Use different measuring instruments in civil engineering field.
- Analyse the problems that occurs in the various smart materials.

UNIT I INTRODUCTION TO SMART MATERIALS AND STRUCTURES 9

Introduction to smart materials and structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.- Introduction to high bandwidth - Low strain generating (HBLS) smart materials.

UNIT II MEASURING TECHNIQUES 9

Strain measuring techniques using electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature compensation – Strain Rosettes.

UNIT III SENSORS 9

Sensing technology – Types of sensors – Physical measurement using Piezo electric strain measurement – Inductively read transducers – The LVOT – Fiber optic techniques - Chemical and bio-chemical sensing in structural assessment – Absorptive chemical sensors – Spectroscopes – Fibre optic chemical sensing systems and distributed measurement-Sensors based on HBLS smart materials - Sensors based on LBHS smart materials.

UNIT IV ACTUATORS 9

Actuator techniques – Actuator and actuator materials – Piezoelectric and electrostrictive material – Magneto structure material– Shape memory alloys – Electro rheological fluids– Electromagnetic actuation – Role of actuators and actuator materials. - Integration of smartsensors and actuators to smart structures.

UNIT V SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data acquisition and processing – Signal processing and control for smart structures – Sensors as geometrical processors – Signal processing – Control system – Linear and non-linear.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Advanced smart materials in construction - Common problems that arise in the different measuring equipments - Future development in smart structures.

TOTAL: 45

TEXT BOOKS

1. Paolo Gaudenz,"Smart Structure: Physical behavior, mathematical modeling and and Materials", Wiley-Blackwell,2009
2. DallyJ.W. and RileyW.F. – Experimental Stress Analysis – Tata McGraw-Hill, 2005.

REFERENCES

1. Srinath,L.S "Experimental Stress Analysis" – Tata McGraw-Hill, 1998.
2. Peter L. Reece, "Smart materials and structures",.Publisher: Nova Science Publishers.(2007)

13C002 INDUSTRIAL WASTEWATER MANAGEMENT 3 0 0 3

OBJECTIVES

- To learn the current practices in wastewater treatment in general with specific reference to industrial wastewater treatment and technologies.
- To understand the principles, objectives and basic criteria for the selection of processes for wastewater treatment and or recycling with an attention to environmental sustainability.

OUTCOMES

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

- Use the current technologies in waste water treatment
- Use the different types of wastewater process units to achieve the discharge limits and minimise the trade waste charge

UNIT I INTRODUCTION TO INDUSTRIAL WASTE **9**

Effects of industrial wastes on streams, land and wastewater treatment plants – Water quality criteria – Effluent standards – Industrial effluent – volume reduction – Strength reduction – Process modification – Methods and materials changes – Housekeeping – Established recovery and reuse methods for byproducts within the plant operations – Regularity requirements and environmental legislations.

UNIT II INDUSTRIAL EFFLUENT TREATMENT **9**

Equalization and neutralization – Separation of solids – Physio–chemical treatment – Removal of organic and inorganic solids – Combined treatment of industrial and municipal wastes – Individual and common Effluent treatment plants. Biological treatment methods – Aerobic and anaerobic digestion – Ultimate disposal of sludge – Cleaner technologies and pollution prevention – Waste minimization – Management of RO rejects.

UNIT III ADVANCED WASTEWATER TREATMENT, REUSE AND RESIDUE MANAGEMENT **9**

Chemical oxidation–Ozonation–Photocatalysis –Wet air oxidation – Evaporation – Ion exchange – Membrane technologies – Nutrient removal – Land treatment – Well injection. Quantification and characteristics of sludge – Thickening, Digestion, Wet combustion – Conditioning, dewatering and Disposal of sludge.

UNIT IV CASE STUDIES **9**

Industrial manufacturing process description – Wastewater characteristics and effluent treatment flow sheet for textiles– Sugar mill– Distilleries–Thermal power plant–Nuclear power plant–Petroleum refineries– Fertilizers and dairy.

UNIT V CASE STUDIES **9**

Wastewater characteristics and effluent treatment flow sheet for Tanneries – Pulp and paper mill – Chemical industries – Metal finishing industries – Iron and steel industries – Meat packing industries and poultry plant – Industrial estates and industrial clusters.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Practical techniques for handling industrial waste and designing treatment facilities - Water cycle management, including water use minimisation and recycling of industrial effluents

TOTAL: 45

TEXT BOOKS

1. Karia.G.L., Christian R.A., "Wastewater Treatment", PHI Publications,2nd Edition, 2013
2. MogensHenze, PoulHarremoes, Jansen, Erik Arvin, "Wastewater Treatment",Springer,2010

REFERENCES

1. Punmia B.C; Ashok Kumar Jain; Arun Kumar J, " Waste Water Engineering", Lakshmi Publications 2012.
2. Mahajan S. P. "Pollution Control in process industries", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008.

13C003 ARCHITECTURE AND TOWN PLANNING 3 0 0 3

OBJECTIVES

At the end of the course the student should be able

- To learn the design and planning of the building as per the building bye laws
- To study about the various aspects in interior and exterior designing

OUTCOMES

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

- Design and plan the building as per the building bye laws
- To use the building guidelines for site plan preparation

UNIT I BASIC ELEMENTS OF ARCHITECTURE **9**

Introduction of Architecture – Definition – Mass and space visual emotional effects of geometric forms and their derivatives– The sphere, the cube, the pyramid, the cylinder and cone – The aesthetic qualities of Architecture – Proportion, scale,balance, symmetry, rhythm and axis – Contrast in form –General aspects of architectural projects– Harmony– Site plans

UNIT II PRINCIPLES OF OREINTATION AND PLANNING OF BUILDINGS **9**

General – Functional planning of building– Factors affecting orientation – Sun – Wind – Rain – Orientation criteria for Indian conditions – Principles governing the theory of planning – Planning of residential building.

UNIT III ELEMENTS OF INTERIOR DESIGN **9**

General – Decorative materials – Cement bonded board (BISON PANEL)– Water proof cement paint– Industrial glazing and roofing– Unit masonry–Plaster and dry wall–Wall surface materials– Effect of colour on architecture – Home furnishing – Plans in rooms.

UNIT IV TOWN PLANNING

History of evolution of towns – Town and environment – Climate, humidity, wind and radiation – Surveys and data collection – Residential neighborhoods – Industrial areas – Public buildings – Housing and slum clearance– Importance of master plan– Present day planning in India

UNIT V BUILDING RULES AND GUIDELINES

General – Zoning regulations – Regulations regarding lay outs or subdivisions – Building regulations – Rules for special types of buildings – Floor space index – Minimum plot size and building front age – Open spaces – Minimum standard dimensions of building elements – Provision for lighting and ventilation – Provision for means of access.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

To make a survey and calculate the land area for a particular region – Improve the architectural modeling for the roadways and industrial areas.

TOTAL: 45

TEXT BOOKS

1. Rangwala S.C, "Town Planning", Charotar Publishing House Private Limited, 26th edition 2013.
2. Agarwala S.C, Architecture and Town Planning, Dhanpatrai&sons 2013.

REFERENCES

1. Hiraskar, "Fundamentals in town planning" Dhanpatrai, 17th edition 2013.
2. Principles and Practice of Town and Country Planning Lewis B. Keeble, Estates Gazette, University of Michigan,2010
3. National Building Code of India– Part–III.(2005).

13C004 PAVEMENT ENGINEERING 3 0 0 3

OBJECTIVES

- To study the concept of design of road and airport pavements
- To understand the different types of failures in pavements and techniques for maintenance

OUTCOMES

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

- Design of road and airport pavements
- Solve the problems related to maintenance of pavements

UNIT I COMPONENTS OF PAVEMENT AND FACTORS AFFECTING DESIGN 9

Pavement –Types- Comparison between highway and airport pavements- Component parts of pavements – Functions and significance of sub grade properties - Various methods of assessment of sub grade soil strength for pavement design- Soil and base stabilization- Base and sub base drainage- Factors affecting design and performance of pavements - ESWL

UNIT II DESIGN OF FLEXIBLE ROAD PAVEMENTS 9

Stresses in layered systems - Burmister two layer and three layer analysis- Methods of design based on pavement performance- AASHTO and Asphalt institute method (Concepts only) – CBR method- Design as per the IRC guidelines (Problems)- Design and specification of rural roads.

UNIT III DESIGN OF RIGID ROAD PAVEMENTS 9

Cement concrete pavements – Analysis of stresses- AASHTO and PCA methods for design (Concepts only)- Design as per latest IRC guidelines(Problems) – Design for reinforcement and joints- Design of cement concrete roads for rural roads (Problems).

UNIT IV DESIGN OF AIRPORT PAVEMENTS 9

Flexible pavement design- Methods- CBR, Burmister, and FAA methods(Concepts only)
Rigid pavement design- LCA and FAA methods (Concepts only) – Joints in concrete pavements

UNIT V PERFORMANCE EVALUATION AND MAINTENANCE 9

Types of defects in Flexible pavements – Surface defects, Cracks, Deformation, Disintegration –Symptoms, Causes and Treatments. - Types of Pavement - Failures in Rigid Pavements –Scaling, shrinkage, warping - Structural cracks, spalling of joints and mud pumping - Special Repairs - Pavement Evaluation – Pavement Surface conditions and structural evaluation - Evaluation of pavement - Failure and strengthening - Overlay design by Benkelman beam method [Procedure only]

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Modern techniques for repair of pavements - Analysis of temperature stress by non-linear method - Soil stabilization techniques

TOTAL: 45

TEXT BOOKS

1. Yoder R.J and Witczak M.W., “Principles of Pavement Design”, John Wiley, 2011.
2. Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 2005.
3. Dr. Sharma S.K.,Principles, Practice and Design & Highway Engineering, S.Chand & Company, New Delhi, 2012

REFERENCES

1. Guidelines for the design of Flexible Pavements, IRC:37 - 2001, The Indian Roads Congress, New Delhi.
2. Guideline for the design of rigid pavements for highways, IRC: 58-2002, The Indian Roads Congress, New Delhi.
3. Guidelines for design of CC roads for rural roads, IRC:SP 62 – 2004, The Indian Roads Congress, New Delhi.
4. Wright, P.H., "Highway Engineers", John Wiley & Sons, Inc., New York, 2009.
5. Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001.

13C005 COASTAL ZONE MANAGEMENT 3 0 0 3

OBJECTIVES

- To understand how coasts "work".
- To understand the role of humans in coastal systems.
- To learn the ongoing developments in coastal zone management.

OUTCOMES

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

- Analyse the role of humans in coastal systems.
- To use the concept with past and current practice in ongoing projects in coastal zone management.

UNIT I COASTAL ZONE **9**

Coastal Engineering – Coastal Environment – Problems, Coastal water level fluctuations – Tides surges and seiches.

UNIT II WAVE DYNAMICS **9**

Wave classification – Airy's Linear Wave theory – Irregular and regular waves –Short and long term wave analysis - Deep water waves – Shallow water waves –Wave pressure – Wave energy – Wave Decay – Reflection, Refraction and Diffraction of waves– Breaking of waves

UNIT III WAVE FORECASTING AND TIDES **9**

Characteristic of waves- Need for forecasting - SMB and PNJ methods of wave forecasting – Classification of tides Forecasting of wave direction- –Darwin's equilibrium theory of tides – Effects on structures

UNIT IV COASTAL PROCESSES **9**

Erosion and depositional shore features – Methods of protection – Littoral currents – Coastal Aquifers – Sea water intrusion – Impact of sewage disposal in seas.

UNIT V HARBOURS **9**

Classification of harbours – Requirements of a modern port – Selection of site – Typical latout of general features Types and selection of break waters – Need and mode of dredging – Selection of dredgers

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Coastal GIS analysis- Diagnosis of environmental conditions along coastal areas- Direct practical approach on coastal area construction issues- Coastal zone and related Indian projects

TOTAL:45

TEXT BOOKS

1. Kamphius, J. W., Introduction to Coastal Engineering and Management, World Scientific, 2010.
2. Sorenson, R. M., Basic Coastal Engineering, John Wiley and Sons, 2005.

REFERENCES

1. Robert L Wiegel, Rodney J Sobey, Orville T Magoon, Eleanor Swent, "Coastal Engineering: Research, Consulting, and Teaching", Nabu Press,2010
2. Christopher Fleming, " Coastal Engineering processes, Theory and Design practice: Process, Theory and Design Practice", T&F Books UK, 2009

13C006 AIR AND WATER QUALITY MODELLING 3 0 0 3

OBJECTIVES

- To learn how to model the most important water and air quality parameters
- To understand the interaction of water and air quality parameters
- To identify appropriate modeling solutions for air and water quality problems
- To understand the basics of ground water modeling

OUTCOMES

On completing the course, students should be able to

- Use mathematical methods and tools in the analysis of air and water quality related problems
- Use mathematical models relevant to solution of air and water quality problems and appreciate their limitations.

UNIT I INTRODUCTION TO MODELLING **9**

Role of mathematical models-Systems approach-Systems and models-Kinds of mathematical models-Model development and validation-Effluent and stream standards-Ambient air quality standards.

UNIT II SURFACE WATER QUALITY MODELLING **9**

Historical development of water quality models-Rivers and streams water quality modeling-River hydrology and flow-Low flow analysis-dispersion and mixing-Flow, depth and velocity-Lakes and impoundments-Water quality response to inputs-Water quality modeling process-Model sensitivity-Assessing model performance-Models for dissolved oxygen, pathogens-Streeter-Phelps models.

UNIT III AIR QUALITY MODELLING **9**

Transport and dispersion of air pollutants-Wind velocity, wind speed and turbulence-Estimating concentrations from point sources-Gaussian equation-Determination of dispersion parameters-Atmospheric stability-Types of modeling technique-Modeling for non-reactive pollutants-Single source, short term impact, multiple sources and area sources, Fixed box models- diffusion models- Gaussian plume derivation-Modifications of Gaussian plume equation- Long term average multiple cell model- Receptor oriented and source oriented air pollution models model performance, accuracy and utilization.

UNIT IV GROUNDWATER QUALITY MODELLING **9**

Mass transport of solutes-Degradation of organic compounds-Application of concepts to predict groundwater contaminant movement-Seawater intrusion-Basic concepts and modeling

UNIT V COMPUTER MODELS **9**

Exposure to computer models for surface water quality, groundwater quality and air quality.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Determination of air and water quality indices

TOTAL: 45

TEXT BOOKS

1. Steven C.Chapra, Surface Water Quality Modeling, Waveland Pr, Inc., 2008.
2. Boubel. R.W, Fundamentals of Air Pollution, Elsevier 2006.

REFERENCES

1. Schnoor. J.L, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
2. Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006.

13C007 REMOTE SENSING TECHNIQUES AND APPLICATIONS 3 0 0 3

OBJECTIVE

- To study the concepts of Remote Sensing techniques and its application in natural resource management and Civil Engineering.

OUTCOMES

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

- Analysis remote sensing data related to land use, natural resources
- Apply remote sensing in the field of Civil Engineering and natural resource management

UNIT I INTRODUCTION TO REMOTE SENSING **9**

Definition – Physics of remote sensing – electromagnetic radiation (EMR) – Atmospheric windows – Interaction of EMR with atmosphere, earth surface, soils, water and vegetation – Platform and sensors – image interpretations.

UNIT II LAND USE STUDIES **9**

Definition of land use – Land use / land cover classification – Schemes and levels of classification systems with RS data – Land use mapping – Change detection – Urban land use planning, site suitability analysis, transportation planning

UNIT III WATER RESOURCES **9**

Areal assessment of surface water bodies – Capacity survey of water bodies – Mapping of snow-Covered areas – Flood risk zone mapping – Identification of groundwater potential zones, recharge areas – Droughts, definition, drought assessment and management.

UNIT IV AGRICULTURE, SOIL AND FORESTRY **9**

Crop inventory mapping – Production estimation – Command area monitoring – Soil mapping – Crop stress detection - Estimation of soil erosion – Forest types and density mapping – Forest fire risk zone mapping.

UNIT V EARTH SCIENCE **9**

Lithology – Lithological mapping – Structural mapping – Geomorphology – Nature and type of landforms – Identification – Use of remote sensing data for land slides – Targeting mineral resources – Engineering geology and Environmental geology.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Terrain mapping and analysis- National urban information system – Flood mapping and monitoring

TOTAL: 45

TEXT BOOKS

1. Lillesand, T.M and Kiefer R.W. Remote Sensing and Image interpretation. John Willey and sons, inc. New York, 2007.
2. Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, New York, 1986.

REFERENCES

1. Steven, M.D, and Cllark, J.A. Application of Remote sensing in Agriculture, Butterworths, London, 1990.
2. Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No.IRS-UP/SAC/FMDD/TN/16/90,1990.
3. Sabins, F.F.Jr. Remote sensing principles and interpretation, W.H.Freeman& Co., 2007.
4. Manual of Remote Sensing Vol. II. American Society of Photogrammetry.

13C008 TRAFFIC ENGINEERING ANMANAGEMENT 3 0 0 3

OBJECTIVES

- To understand the different types of traffic survey
- To know the concept of design of intersections and traffic signal.
- To know the different types of traffic management measures.

OUTCOMES

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

- Analyse the results of traffic survey
- Design intersections and traffic signals
- Solve traffic problems.

UNIT I INTRODUCTION TO TRAFFIC ENGINEERING **9**

Significance and scope, Characteristics of vehicles and road users - Skid Resistance and braking efficiency (Problems), Components of traffic engineering- Road - Traffic and land use characteristics - Detrimental effects of traffic on environment.

UNIT II TRAFFIC SURVEYS AND ANALYSIS **9**

Surveys and analysis – Volume - Speed, Capacity - Level of service- Speed and delay studies - Origin and destination survey - Parking surveys - Accident studies and analysis

UNIT III TRAFFIC CONTROL **9**

Traffic signs - Road markings - Design of traffic signals and signal co-ordination (Problems), Traffic control aids and street furniture - Street lighting - Traffic regulations

UNIT IV GEOMETRIC DESIGN OF INTERSECTIONS **9**

Conflicts at intersections - Classification of intersections at grade - Channelized and unchanalised intersection - Grade separators (Concepts only) - Principles of intersection design - Elements of intersection design - Rotary design (Problems) - Grade Separators

UNIT V TRAFFIC MANAGEMENT **9**

Traffic management- Traffic system management (TSM) and Travel Demand Management (TDM) - Traffic segregation, Traffic calming, Traffic forecasting techniques, Introduction to Intelligence Transport System (ITS) - ITS user needs and services – Travel and Traffic management - Public Transportation Management - Electronic payment, Commercial vehicle operations - Emergency management - Advanced vehicle safety systems - Information Management.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Simulation of traffic- Trip generation – Trip distribution – Traffic assignment – Landuse transport models

TOTAL: 45

TEXT BOOKS

1. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Publications, Delhi, 2009.
2. Khanna S.K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.

REFERENCES

1. Indian Roads Congress (IRC) Specifications, Guidelines and Special publications on Traffic Planning and Management.
2. Guidelines of Ministry of Road Transport and Highways, Government of India.
3. SubhashC.Saxena, A Course in Traffic Planning and Design, DhanpatRai Publications, New Delhi, 1989.
4. IRC:92- 1985 Guidelines for the Design of Interchanges in Urban Areas,IRC,New Delhi.

5. IRC:93- 1985 Guidelines on Design and Installation of Road Traffic Signals, IRC,New Delhi.

13C009 HOUSING PLANNING AND MANAGEMENT 3 0 0 3

OBJECTIVES

- To understand the comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects
- To learn the principles of sustainable housing policies and programmes
- To understand the cost effective construction materials and methods.

OUTCOMES

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

- Use the knowledge in planning the housing projects and their development
- Analyse the techniques and materials used in housing projects

UNIT I INTRODUCTION TO HOUSE PLANNING **9**

Definition of basic terms – House, home, household, apartments, multi storeyedbuildings, special buildings, Objectives and strategies of national housing policies, principle of sustainable housing, housing laws at state level, bye–laws at urban and rural local bodies – Levels – Development control regulations, Institutions for housing at national, state and local levels

UNIT II HOUSING PROGRAMMES **9**

Basic concepts, contents and standards for housing programmes– Sites and services, neighborhoods, open development plots, apartments, rental housing, Co–operative housing, slum housing programmes, role of public, private and non–government organizations, current issues in housing

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS **9**

Process of public and private sector housing development process– Evaluation of user satisfaction– Formulation of housing projects – Site analysis, layout design, design of housing units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST–EFFECTIVE MATERIALS **9**

New constructions techniques – Cost effective modern construction materials, building centers – Concept, functions and performance evaluation–Principles of economic and financial evaluation techniques

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL **9**

Appraisal of housing projects – Housing finance, cost recovery – Cash flow analysis, subsidy and cross subsidy, role of cooperatives and various institutions– Pricing of housing units, rents, recovery pattern (Problems)– Investment in housing in public and private sectors.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Use of computer packages for analyzing urban data- Legal principles and issues essential to understanding the workings of the real estate industry- Principles of GIS applied to problems in urban design and planning

TOTAL: 45

TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

REFERENCES

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat) Nairobi,1994.
3. National Housing Policy, 1994, Government of India.

13C010 GROUND WATER ENGINEERING 3 0 0 3

OBJECTIVES

- To understand the distribution of ground water, evaluation of aquifer parameters, solving ground water equations.
- To study water methods, Ground water quality and development of ground water methods are dealt.

OUTCOME

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

- Analysis and design hydraulics, parameters of estimation and its quality and development

UNIT I FUNDAMENTALS OF GROUND WATER **9**

Introduction – Characteristic of ground water – Distribution of water - Ground water column –Permeability - Darcy's Law - Laboratory permeability test - Types of aquifers - Hydrogeological Cycle – Water level fluctuations.

UNIT II HYDRAULICS OF FLOW **9**

Storage coefficient - Specific field - Heterogeneity and anisotropy -Transmissivity - Governing equations of ground water flow - Steady state flow - DupuitForchheimer assumptions - Velocity potential - Flow nets

UNIT III ESTIMATION OF PARAMETERS **9**

Transmissivity and storativity – Pumping test - Unsteady state flow - Thies method - Jacob method - Image well theory – Effect of partial penetrations of wells - Collectors wells.

UNIT IV GROUND WATER DEVELOPMENT **9**

Infiltration gallery - Conjunctive use - Artificial recharge -Safe yield -Yield test – Geophysical methods – Selection of pumps.

UNIT V GROUND WATER QUALITY **9**

Ground water chemistry - Origin, movement and quality - Water quality standards - Saltwater intrusion – Environmental concern.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

The pole of groundwater in large - Scale water and chemical budgets – In-situ methods for ground water contamination studies.

TOTAL: 45

TEXT BOOKS

1. Raghunath H.M., “Ground Water Hydrology”, Wiley Eastern Ltd., 2000.
2. Todd D.K., “Ground Water Hydrology”, John Wiley and Sons, 2nd edition, 2006.

REFERENCE

1. C Walton, “Ground Water Resource Evaluation”, McGraw-Hill Publications, 1990

13C011 GROUND IMPROVEMENT TECHNIQUES 3 0 0 3

OBJECTIVES

- To introduce engineering principles of ground modification, grouting and improvement techniques.
- To impart knowledge on the design methods of ground improvement.
- To enhance knowledge on different tests to be carried out on soils.

OUTCOMES

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

- Deal with structures which can self adjust their stiffness with load.
- Implement the improvement techniques in the projects.
- Able to understand the problems in the soil.
- Perform the different test on soil

UNIT I GROUND WATER LOWERING AND DRAINAGE TECHNIQUES **9**

Overview of: Design input parameters: existing ground water level and fluctuations – Zone of groundwater lowering – Permeability – Transmissibility – Storage capacity – Flow nets and estimation.

UNIT II UNDERPINNING **9**

Basic principles of underpinning – Grouping – Requirements - Shoring and temporary support – Grillages – Design considerations for underpinning – Slurry walls in lieu of underpinning – Pre founded columns – Intermittent lateral underpinning – Element wall underpinning.

UNIT III GROUTING **9**

Grouting: Hydro fracture grouting – Compaction grouting – Permeation grouting – Cost considerations - Jet grouting – Applications: Vertical/Sub Vertical And Horizontal/Sub Horizontal – Design Aspects – Selection Of Grout – Selection Of Jet Grout Parameters With Respect To Soil Types – Characteristics Of Jet Grouted Soils.

UNIT IV SOIL COMPACTION AND CONSOLIDATION **9**

Introduction:– Preloading – Consolidation drainage – Compaction grouting– Stone columns – Consolidation of Fine grained soils – Deformation of cohesion less soils – Design considerations.

UNIT V MISCELLANEOUS TOPICS **9**

Geotechnical verification testing – Performance monitoring – Optical survey techniques – Settlement plates and Deep settlement markers – Peizometers

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Methods of performing different soil test in field- Common problems that arise in implementing the techniques in field- Future development in improvement techniques.

TOTAL: 45

TEXT BOOK

1. Petros P. Xanthakos, Lee W. Abramson and Donald A. Bruce, Ground Control and Improvement, John Willey & Sons Inc., 1994

REFERENCES

1. Hsai Yang Fang, Foundation Engineering Handbook, Van Nostrand Reinhold, NY, 1991
2. M. R. Hausman, Engineering Principles of Ground Modification, McGraw Hill Book Co., Singapore, 1990

13C012 DISASTER MANAGEMENT AND MITIGATION **3 0 0 3**

OBJECTIVES

- To understand the knowledge of the disaster phenomenon, its different contextual aspects, impacts and public health consequences.
- To learn the skills and ability to design, implement and evaluate research on disasters.

OUTCOMES

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

- To analyse, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
- To analyse the potential effects of disasters and methods to deliver public health response to avert these effects.

UNIT I INTRODUCTION TO DISASTER MANAGEMENT **9**

Dimensions of natural & anthropogenic disasters – Principles /components of disaster management, Organizational structure for disaster management,–Disaster management schemes– Natural disasters and mitigation efforts – Flood control – Drought management – Cyclones – Land use planning, NBC threat and safety measures – Forest fires – Oil fires – Crisis in power Sector – Accidents in coal mines

UNIT II DISASTER MANAGEMENT **9**

Operations Management (OM) – Risk assessment and disaster response – Antifriction techniques – NGO management –SWOT analysis based on design &formulation strategies – Insurance & risk management, Institution awareness and safety programmes

UNIT III RECENT TRENDS IN DISASTER MANAGEMENT **9**

Psychological and social dimensions in disasters – Trauma and stress – Emotional intelligence – Electronic warning systems – Recent trends in disaster information provider – Geo Informatics

UNIT IV APPLICATIONS **9**

Applications in disaster management – Statistical seismology– Quick reconstruction technologies – Role of media in disasters – Management of epidemics – Bio-Terrorism– Forecasting and Management of casualties.

UNIT V DISASTER MANAGEMENT IN INDIA **9**

Disaster preparedness– Disaster mitigation – Forecasting and warning of disasters – Assessing risk and vulnerability – Disaster management in India – Role of news media in Disaster management – Rehabilitation of victims.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Causes and effects on earthquake, tornado, extreme heat, tsunami, flood, volcano, hurricane, wildlife, hurricane, landslides and mudflows

TOTAL: 45

TEXT BOOKS

1. Singh.R.B, Disaster Management, Rawat publications, 3rd edition 2000
2. Pardeep Sahni, Alka Dhameja, Uma Madury, PHI learning Pvt Ltd, 2013

REFERENCES

1. Sundar.I., Disaster Management , Sarup& Sons, 3rd edition 2007,New Delhi
2. SathishModh, Introduction to Disaster Management, Macmillan piblishers, 2nd edition,2009, New Delhi

13C013 HYDROLOGY 3 0 0 3

OBJECTIVES

- To understand all the components of the hydrological cycle.
- To study the concept of mechanics of rainfall, it's spatial and temporal measurement and their applications.
- To understand the different types of simple statistical analysis and application of probability distribution of rainfall and run off.
- To learn the concepts of simple methods of flood routing and ground water hydrology.

OUTCOMES

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

- Basics of precipitation, abstraction, hydrologic cycle
- Hydrograph, types and their application
- Methods of flood routing
- Basics of groundwater.

UNIT I PRECIPITATION **9**

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

UNIT II ABSTRACTION FROM PRECIPITATION **9**

Losses from precipitation – Evaporation losses – Reservoir evaporation – Infiltration losses – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III HYDROGRAPHS **9**

Factors affecting hydrograph – Base flow separation – Unit hydrograph – Derivation of unit hydrograph – S-curve hydrograph – Unit hydrograph of different deviations - Synthetic unit hydrograph.

UNIT IV FLOOD ROUTING **9**

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's channel routing – Flood control.

UNIT V GROUND WATER HYDROLOGY **9**

Types of aquifer – Darcy's law – Dupuit's assumptions – Confined aquifer – Unconfined aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Hydrology in military planning and operations – Water budgeting.

TOTAL: 45

TEXT BOOKS

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2010.
2. Raghunath, H.M., "Hydrology", New Age International Publishers,2006 2nd edition

REFERENCES

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000.
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd., 2000.
3. JayaramiReddi.P.,"A Text book of Hydrology", Laxmi Publications, New Delhi, 1997

13C014 ROCK ENGINEERING 3 0 0 3

OBJECTIVES

- To study the classification and properties of rocks.
- To learn about the various stresses acting in rocks and their measurement.
- To understand the application of rock mechanics in Engineering.

OUTCOMES

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

- Classify the rocks.
- Analyse the various stresses acting on the rocks.

UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS **9**

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

UNIT II ROCK STRENGTH AND FAILURE CRITERIA **9**

Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength – Stress strain behaviour in compression – Mohr-coulomb failure criteria and empirical criteria for failure – Deformability of rock.

UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS **9**

Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – Technique for measurements of in-situ stresses.

UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING **9**

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

UNIT V ROCK BOLTING **9**

Introduction – Rock bolt systems – rock bolt installation techniques – Testing of rock bolts – Choice of rock bolt based on rock mass condition.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Purpose of tunneling and geological problems connected with tunneling- Basic design and principles of tunnels in rocks - Types and design of tunnel lining.

TOTAL: 45

TEXT BOOKS

1. Goodman P.E., “Introduction to Rock Mechanics”, John Wiley and Sons, 1999.
2. Stillborg B., “Professional User Handbook for rock Bolting”, Tran Tech Publications, 1996.

REFERENCES

1. Brow E.T., “Rock Characterisation Testing and Monitoring”, Pergaman Press, 1991.
2. Engineering Rock Mechanics, Part 2: Illustrative Worked Examples, Elsevier Publishing Company,2001.
3. Brady, B.H.G. and Brown, E.T., Rock mechanics for underground mining (Third Edition), Kluwer Academic Publishers, Dordrecht, 2004.

13C015 ENVIRONMENTAL IMPACT ASSESSMENT OF CIVIL ENGINEERING PROJECTS **3 0 0 3**

OBJECTIVES

- To study the current EIA methods, techniques and tools used
- To study the current assessment methods and legislation
- To study the current environmental monitoring systems
- To understand the process of environmental impact modeling and prediction as a design tool

OUTCOMES

At the end of the course should be able to

- Deal with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same.
- Apply the knowledge acquired to the process of environmental impact modeling and prediction as a design tool with application to a number of case studies
- Comprehend the various impacts of development projects on environment and the mitigating measures.

UNIT I EIA AND BRAOD COMPONENTS **9**

Introduction-Definitions and concepts-Rationale and historical development of EIA- EIA for civil engineers-Environmental impact factors and areas of consideration in civil engineering-EIA capability and limitations-Legislative and environmental clearance procedures inIndia-Prediction tools for EIA

UNIT II METHODOLOGIES **8**

Measurement of environmental impact-Scope and methodologies of EIA-Screening-Scoping-Base line studies-Mitigation-Matrices-Check list.

UNIT III PREDICTION AND ASSESSMENT **9**

Assessment of Impact on land, water and air, noise, flora and fauna-Mathematical models-Public participation-Socio cultural environment-resettlement and rehabilitation.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN **10**

Principles, problems and strategies- Review of political, ecological and remedial actions- Introduction to ISO and ISO 14000-EMS regulations-Wider application of system based approach-Post project monitoring-Environmental audit-Life cycle assessment.

UNIT V CASE STUDIES **9**

EIA for infrastructure projects- Bridges-Highways-Dams-Multi-storey buildings-Water Supply and drainage projects

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Relevant provisions of Indian forest act, Public liability insurance act, CrPC, IPC -Public Interest Litigation - Writ petitions - Supreme Court Judgments in Landmark cases.

TOTAL: 45

TEXT BOOKS

1. Canter R.L., “Environmental Impact Assessment”, Academic Internet Publishers, 2007.
2. Anjaneyulu Y., “ Environmental impact assessment methodologies” BS Publications/BSP Books ,2010.

REFERENCES

1. Judith Petts, Handbook of Environmental Impact Assessment Vol.I and II, Blackwell Publishing, New York, 2005

2. Chari K.B.,"Comprehensive Environmental Impact Assessment on Water Resources Projects" Discovery Publishing House 2005

13C016 AIR POLLUTION AND CONTROL 3 0 0 3

OBJECTIVES

- To study the characteristics and effects of air pollution and the methods of controlling the same.
- To understand the role of meteorology and its influence on air pollution
- To learn the basics of indoor air pollution and noise pollution, the changing approaches to evaluate the quality of indoor air and noise pollution, and the benefits of an effective indoor air quality management and noise control program.
- To know the pollution prevention strategies, laws, regulations and compliance.

OUTCOMES

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

- Analyse the dynamics of air pollutants in the atmosphere
- Select an appropriate control technology for air pollutants.
- Mitigate the air pollution emission problems by understanding the meteorological factors
- Keep abreast about macro and micro pollution and the process of controlling the same.

UNIT I AIR QUALITY: CLASSIFICATION, SOURCES AND EFFECTS **9**

Air pollution-a retrospective-Classification of air pollutants- Gaseous and particulate pollutants-Sources of pollutants- Effects of air pollution on biosphere-Units of measurement-National and International air emission standards-Air pollution emission inventory-Emission factor-Air quality index.

UNIT II DISPERSION AND ATMOSPHERIC STABILTY **9**

Elemental properties of the atmosphere-Meteorological factors-Wind rose-Lapse rate-Dispersion of contaminants-Atmospheric stability and turbulence-Gaussian plume dispersion model: theory and application

UNIT III CONTROL OF GASEOUS AND PARTICULATEPOLLUTANTS **9**

Principles and design of control measures-Particulates control by gravitational settling chambers-Centrifugal separators-Filtration-Scrubbers-Electrostatic precipitation-Gaseous pollutant control by adsorption, absorption, condensation, combustion-Selection criteria-Pollution control for specific major industries.

UNIT IV POLLUTION PREVENTION **9**

Pollution prevention strategies-Laws and regulations-Compliance and Enforcement

UNIT V INDOOR AIR POLLUTIONAND NOISE POLLUTION **9**

Sources of indoor air pollution: Effects, assessment, standards, control methods and prevention- Sources of noise pollution: Effects, assessment, standards, control methods and prevention

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

GHG emissions, global warming, climate change and carbon credits, CDM, initiatives in India; Sustainable development; Future scenarios.

TOTAL: 45

TEXT BOOKS

1. Rao, C.S. Environmental Pollution Control Engineering, New Age International.2006.
2. Peavy S W, Rowe D R and Tchobanoglous G, “Environmental Engineering”, McGraw Hill, New Delhi, 2013.
3. Griffin, R. D.: Principles of Air Quality Management, Lewis Publishers, 2007

REFERENCES

1. Noel de Nevers, Air Pollution Control Engineering, McGraw Hill, 2000.
2. Mahajan S P, “Pollution Control in Process Industries”, Tata McGraw Hill Publishing Company, New Delhi, 2004.

13C017 SOLID WASTE MANAGEMENT 3 0 0 3

OBJECTIVES

- To understand the necessity and importance of professional solid waste management.
- To learn the methods and means of waste collection and transfer
- To study the different treatment approaches for MSW
- To study the design and operation of landfills

OUTCOMES

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

- Identify key sources, typical quantities generated, composition, and properties of solid wastes;
- Recognize the relevant regulations that apply for MSW handling and disposal
- Identify recycling and reuse options
- Design Solid Waste Landfills
- Adopt a holistic approach towards municipal waste management

UNIT I GENERATION AND CHARCTERIZATION OF SOLID WASTE **9**

Sources-Types and composition of solid wastes-Solid waste generation and estimation-Physical and chemical characteristics of municipal solid waste-Sampling protocols for MSW-Socio economic aspects of improper solid waste management- Regulatory development.

UNIT II ON-SITE HANDLING, STORAGE AND PROCESSING **9**

On-site handling methods-On-site storage and segregation methods-On-site processing of solid wastes-Public health and economic aspects of storage-Separation of wastes-Benefits of reuse and recycle- Material recovery.

UNIT III COLLECTION, TRANSFER AND TRANSPORTAION **9**

Collection services-Types of collection system-Collection routes-Personnel requirements-Types of transfer stations-Transport means and methods-Location of transfer stations.

UNIT IV OFF-SITE PROCESSING OF MSW **9**

Unit operations for processing of MSW-Size reduction, screening, density separation, Fundamentals of thermal processing-combustion, pyrolysis, gasification, incineration-Principles of aerobic and anaerobic composting-Energy recovery.

UNIT V ENGINEERING DISPOSALOF MSW **9**

Landfill classifications-Siting considerations- Generation, movement and control of gases and leachates-Preliminary design and operation of sanitary landfills-Leachate collection and treatment

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Recovery of Biological Conversion Products: Composts and Biogas; Composting and Bio gasification: Technology. Environmental Effects of Composting and Bio gasification.Incineration and Energy Recovery

TOTAL: 45

TEXT BOOKS

1. George Tchobanoglous, Hilary Theisen and Samuel Vigil. “Integrated Solid Waste Management”, McGraw-Hill Publishers, 1993.
2. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. “Environmental Engineering” McGraw-Hill Publishers, 2013
3. John Pichtel. Waste management Practices Municipal, hazardous and Industrial Taylor and Francis 2005
4. Ramachandra T.V., 2006. Management of Municipal Solid Waste, TERI 2011.

REFERENCES

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013
2. Environmental Engineering – A Design Approach Sincero, A.P., and Sincero, G.A., Phi Learning 2009.
3. Solid Waste Engineering – Vesilind, P. A and Worrel W.A, Cengage Learning 2011.

13C018 INDUSTRIAL WASTE MANAGEMENT 3 0 0 3

OBJECTIVES

- To know the current regulations which are pertinent to industrial wastes
- To understand the fate of chemical compounds in the environment and its minimization and prevention.
- To study the treatment strategies for air, soil and water discharges.
- To understand the larger framework of industrial waste and its management

OUTCOMES

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

- Identify current regulations which are pertinent to industrial wastes
- Describe factors which will determine the fate of chemical compounds in the environment and its minimization and prevention.
- Select optimal treatment strategies for air, soil and water discharges.
- Appreciate the larger framework of industrial waste and its management

UNIT I INTRODUCTION TO INDUSTRIAL WASTE MANAGEMENT **9**

Sources and Undesirable Characteristics of industrial waste water-Characteristics of Discharges to the air-Characteristics of Solid Waste Streams from Industries-Effects of industrial wastes.

UNIT II POLLUTION FROM MAJOR INDUSTRIES **9**

Sources andcharacteristics-Waste treatment flow sheets for selected industries such as textiles, tanneries, pharmaceuticals, electroplating industries, dairy, sugar, paper, distilleries, Steel plants, refineries, fertilizer, thermal power plants.

UNIT III TREATMENT TECHNOLOGIES FOR SOLID WASTE DISCHARGES **9**

Characterization of solid wastes-Solid waste incineration- Composting of industrial wastes-Solidification and stabilization of industrial solid wastes

UNIT IV TREATMENT TECHNOLOGIES FOR AIR DISCHARGES **9**

Reduction at the source for air discharges, containment, treatment and removal

UNIT V TREATMENT TECHNOLOGIES FOR INDUSTRIAL WASTEWATER **9**

Equalization-Neutralization-Removal of suspended and dissolved organic solids-Chemical oxidation-Adsorption-Removal of dissolved inorganics-Combined treatment of industrial and municipal wastes-Residue management-Dewatering-Disposal

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Common Effluent Treatment Plants (CETPs): Location, Need, Design, Operation & Maintenance Problems and Economical aspects

TOTAL: 45

TEXT BOOKS

1. Rao .M.N. and A.K.Dutta, “Wastewater Treatment”, Oxford - IBH Publication, 2008
2. Eckenfelder.W.W. Jr., “Industrial Water Pollution Control”, McGraw-Hill Book Company, New Delhi, 2000.

REFERENCES

1. Freeman. H.M., “Industrial Pollution Prevention Hand Book”, McGraw-Hill Inc., New Delhi, 1995.
2. Noureldin. M.B., “Design and Operation for Pollution Prevention Via Mass Integration”, Lap Lambert Academic Publishing , 2010.
3. Bishop, P.L., “Pollution Prevention: Fundamental and Practice”, McGraw-Hill, 2000.

13C019 WATER RESOURCES ENGINEERING 3 0 0 3

OBJECTIVE

- To know the different phases in Water Resources viz planning, collection of relevant data on water resources and also on National Water Policy, Reservoir planning, management and economic analysis.

OUTCOMES

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

- Design of reservoirs
- Use of cost effective analysis of water resources.

UNIT I GENERAL **9**

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Economics of water resources planning, physical and socio economic data – National Water Policy – Collection of meteorological and hydrological data for water resources development.

UNIT II DATA COLLECTION OF ANALYSIS **9**

Hydrologic measurements – Analysis of hydrologic data – Hydrologic station network – Station network design – Statistical techniques in network design.

UNIT III WATER RESOURCE NEEDS **9**

Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan.

UNIT IV RESERVOIR PLANNING AND MANAGEMENT **9**

Reservoir - Single and multipurpose – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls - Channel improvement.

UNIT V ECONOMIC ANALYSIS **9**

Estimation of cost and evaluation of benefits - Discount rate - Discounting factors - Discounting techniques – Computer applications

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Modelling in Water Resources Engineering - Engineering Design of Sustainable Water Resource Systems

TOTAL: 45

TEXT BOOKS

1. Linsley R.K. and Franzini J.B, “Water Resources Engineering”, McGraw-Hill Inc, 2000.
2. Las J.L. and Lee R.R., “Economics of Water Resources Planning”, Tata McGraw-Hill Inc. 2000.

REFERENCES

1. Chaturvedi M.C., “Water Resources Systems Planning and Management”, Tata McGraw-Hill Inc., New Delhi, 1997.
2. Goodman Alvin S., “Principles of Water Resources Planning”, Prentice-Hall, 1984.
3. Duggal, K.N. and Soni, J.P., “Elements of Water Resources Engineering”, New Age International Publishers,2008.

13C020 HAZARDOUS WASTE MANAGEMENT 3 0 0 3

OBJECTIVES

- To build knowledge on hazardous wastes with respect to definitions, regulations, effects, prioritization, prevention of releases and response to releases.
- To study the basics ofwaste emissions to soil, air and water.
- To learn the transportation, treatment, storage and disposal methods.
- To study the waste minimisation and pollution prevention techniques.
- To learn the treatment technologies for hazardous waste.

OUTCOMES

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

- Identify current regulations which are pertinent to hazardous wastes
- Describe factors which will determine the fate of chemical compounds in the environment and its minimization and prevention.
- Cognize the design principles of various site remediation methods
- Select optimal treatment strategies for a particular site and understand the larger framework of site remediation

UNIT I WASTE DEFINITION, GENERATION AND EFFECTS 9

General and legal definitions-Waste compositions and classifications-Waste generation-Effects of improper management-Management options-Hazardous waste management in India

UNIT II POLLUTION PREVENTION AND WASTE MINIMIZATION FACILITIES 10

Contaminant release-Principles and techniques of waste minimization- Volume and toxicity reduction-Material and process modifications.

UNIT III PRINCIPLES AND DESIGN OF THERMAL TREATMENT FACILTIES 6

Status, types, principles, equipment used, application ranges, and comparisons of different thermal treatment technologies-Combustion, incineration, pyrolysis, gasification

UNIT IV PRINCIPLES AND DESIGN OF PHYSICO CHEMICAL AND BIOLOGICAL TREATMENTS 10

Status, types, principles, equipment used, application ranges, and comparisons of different treatment technologies-Air stripping, carbon adsorption, steam stripping, chemical oxidation, bioremediation-solidification and stabilization of wastes

UNIT V SITE REMEDIATION 10

Introduction to site characterization-Methods of site characterization-Passive and active remedial technologies-Soil vapour extraction-Bioventing-Permeable reactive barriers

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Environmental auditing-ISO 14000-Basics and Approaches

TOTAL: 45

TEXT BOOK

1. LaGrega M.D., Buckingham P.L. and Evans J.C.(1994), “Hazardous Waste Management”- Waveland PrInc, 2010.

REFERENCE

1. P. L. Bishop, ‘Pollution Prevention: - Fundamentals and Practice’, Mc-Graw Hill International, Boston, 2000.

13C021 BRIDGE ENGINEERING 3 0 0 3

OBJECTIVES

- To understand the different codal provisions for design of bridges
- To study the concepts for the design of reinforced concrete slab bridge decks, Tee beam and slab bridge decks, plate girder bridges, balanced cantilever bridges and continuous bridges.
- To study the concepts for the design of different types of bridge bearings, piers and abutments, and bridge foundations

OUTCOMES

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

- Design of reinforced bridge components
- Design of steel bridge components
- Design of pre-stressed bridge components
- Design of piers and abutments

UNIT I INTRODUCTION TO BRIDGE,TYPES AND LOADS ON BRIDGES **9**

Classification – Importance of bridges – Investigation for bridges –Selection of bridge site components of bridges – Economical span – Traffic projection – Choice of bridge type-Specification of road bridges – Width of carriageway – Loads to be considered – Dead load –IRC Standard live load – Impact effect.

UNIT II R.C. GIRDER BRIDGES **9**

Design of solid slab bridges- Load distribution theories-Design of tee beam and slab bridges using Pigeauds method –Courbons theory- Design of cantilever beam - Design of articulation.

UNIT III OTHER LONG SPAN GIRDER BRIDGES **9**

Design Principles ofbalanced cantilever bridges – Continuous girder bridges- Railway bridge-Cable stayed bridges- Suspension bridges-Design of box culverts- Design of plate girder bridges.

UNIT IV PRESTRESSED CONCRETE BRIDGES **9**

Design of prestressed concrete bridges – Preliminary discussions – Flexural and torsional parameters – Design of girder section – Cable layout – Check for stresses at various sections.

UNIT V BEARING, SUBSTRUCTURES AND FOOTING FOR BIRDGES **9**

Type of foundations -Evaluation of sub structures – Pier and abutments caps – Design of pier – Abutments - Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges –Electrometric bearing - Construction and Maintenance of bridges – Lessons from bridge failures

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Assessment of dynamic effects in bridges- Seismic response analysis of a major bridge- Collapse analysis of bridge members- Study on widening of old bridges -Problems encountered in launching post tensioned concrete box girders bridges.

TOTAL: 45

TEXT BOOK

1. Krishna Raju.N , Design of Bridges, Oxford and IBH Publishing Co., Pvt Ltd., New Delhi, 2009.

REFERENCES

1. Jagadeesh .T.R, Jayaram. M.A, “Design of Bridge Structures” Prentice-Hall India, New Delhi, 2004.
2. Raina V.K. “Concrete Bridge Practice”, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
3. Johnson Victor. D, Essentials of Bridge Engineering, Oxford and IBH Publishing Co., New Delhi, 2001
4. Ponnuswamy.S , Bridge Engineering, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003
5. IS. 456-2000, Plain and Reinforced Concrete-Code of Practice.
6. IS. 800-2007, Indian Standard Code of Practice for General Construction in Steel.

7. IRC: 6-2010, “Standard specifications and code of practice for road bridges, section II – loads and stresses” (fifth revision).
8. IRC: 18-2000, “Design Criteria for prestressed concrete Road bridges(post tensioned concrete)”, third Revision.
9. IRC: 21-2000, “Standard specifications and code of practice for road bridges, section III,Cement Concrete (Plain Reinforced), Third Revision.
10. IRC: 22-2008,“Standard Specifications and Code of Practice for Road Bridges, Section VI – Composite Construction (Limit States Design), Second Revision.
11. IRC: 24-2010,“Standard Specifications and Code of Practice for Road Bridges, Steel Road Bridges (Limit State Method), Third Revision.
12. IRC: 78-2000,“Standard Specifications and Code of Practice for Road Bridges, Section VII – Foundations and Substructure, Second Revision.
13. IRC: 83-1987 (Part II), “Standard Specifications and Code of Practice for Road Bridges, Section IX – Bearings, Part II: Elastomeric Bearings.

13C022 STORAGE STRUCTURES 3 0 0 3

OBJECTIVE

- To study the principles involved in designing structures which have to store different types of materials.

OUTCOMES

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

- Design of steel, concrete water tanks
- Design the various types of bunkers and silos.

UNIT I STEEL WATER TANKS **10**

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – Side plates – Bottom plates – Joints – Ring girder – Design of staging and foundation.

UNIT II CONCRETE WATER TANKS **9**

Design of circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of underground tanks – Design of base slab and side wall – Check for uplift.

UNIT III STEEL BUNKERS AND SILOS **9**

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT IV CONCRETE BUNKERS AND SILOS **9**

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

UNIT V PRESTRESSED CONCRETE WATER TANKS **8**

Principles of circular prestressing – Design of prestressed concrete circular water tanks

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Design of water tank using limit state method

TOTAL: 45

TEXT BOOKS

1. Krishna Raju N. Advanced Reinforced Concrete Design, CBS Publishers and Distributors, New Delhi, 2005.
2. Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998

REFERENCES

1. IS 800-2007 General construction in steel – code of practice, BIS, New Delhi
2. SP 16: 1980 Design Aids for Reinforced Concrete to IS 456: 2000 BIS, New Delhi.
3. SP 34: 1987 Handbook on Concrete Reinforcement and Detailing BIS, New Delhi.
4. IS 456: 2000 Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi.
5. IS: 1343 - 1980 Code of Practice for Prestressed Concrete, BIS, and New Delhi.
6. IS: 3370 - 1967 Code of Practice for Concrete Structures for Storage of Liquids Part-3: Prestressed Concrete Structures, BIS, New Delhi.

7. IS 3370(Part 2):2009 “Code of practice for concrete structures for the storage of liquids: Part 2 Reinforced concrete structures”, BIS, New Delhi.
8. IS 3370(Part 4):1967 “Code of practice for concrete structures for the storage of liquids: Part 4 Design tables”, BIS, New Delhi.

13C023 DESIGN OF PLATES AND SHELL STRUCTURES 3 0 0 3

OBJECTIVE

- To understand the rudimentary principles involved in the analysis and design of plates and shells

OUTCOME

At the end of the course the student should be to

- Design plate and shell structures.

UNIT I THIN PLATES WITH SMALL DEFLECTION **9**

Laterally loaded thin plates – governing differential equations – Simply supported and fixed boundary conditions

UNIT II RECTANGULAR PLATES **9**

Simply supported rectangular plates – Navier's solution and Levy's method.

UNIT III THIN SHELLS **9**

Classification of shells-structural actions – membrane theory

UNIT IV ANALYSIS OF SHELLS **9**

Analysis of spherical dome – cylindrical shells – folded plates

UNIT V DESIGN OF SHELLS **9**

Design of spherical dome – cylindrical shells – folded plates

UNIT VI STATE OF ART /ADVANCES (NOT FOR EXAMINATION)

Design of shell and dome structures using - MAT lab

TOTAL: 45

TEXT BOOKS

1. Bairagi N K, A text book of Plate Analysis, Khanna Publishers, New Delhi, 2002.
2. Mehdi Fershad "Design and Analysis of shell structures" Kiliclkler Academic publishers, 2002.

REFERENCES

1. Krishnaraju.N, "Advanced Reinforced concrete Design" CBS Publishers and Distributers, New Delhi, 2003.
2. Chandrasekara.K, "Theory of Plates" University Press, Hyderabad, 2001.
3. IS 2210:1988 Criteria for design of reinforced concrete shell structures and folded plates (First Revision), BIS, New Delhi.

13C024 TALL BUILDINGS 3 0 0 3

OBJECTIVES

- To learn about the design philosophy of tall buildings
- To study the concept of design of various high rise buildings
- To understand the methods adopted for analyzing the buildings using various loading conditions

OUTCOMES

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

- Use different methods for analyzing high rise buildings
- Understand about the behaviour of structures under loading condition.

UNIT I INTRODUCTION TO TALL BUILDINGS 9

Design philosophy – Materials – Loading - gravity loading - wind loading - Earthquake loading -blast loading.

UNIT II THE VERTICAL STRUCTURE PLANE 9

Dispersion of vertical forces- Dispersion of lateral forces - Optimum ground level space - Shear wall arrangement - Behaviour of shear walls under lateral loading - The floor structure or Horizontal building plane floor framing systems-Horizontal bracing- Composite floor systems- The highrise building as related to assemblage kits Skeleton Frame Systems - Load bearing wall panel systems - Panel – Frame systems - Multistory box systems.

UNIT III COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD 9

The bearing wall structure- The shear core structure - Rigid frame systems- The wall - Beam structure: Interspatial and staggered truss systems - Frame - Shear wall building systems - Flat slab building structures - Shear truss - Frame interaction system with rigid - Belt trusses - Tubular systems-Composite buildings - Comparison of high - Rise structural systems Other design approaches controlling building drift efficient Building forms - The counteracting force or dynamic response.

UNIT IV APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS 9

Approximate analysis of bearing wall buildings- The cross wall structure - The long wall structure -The rigid frame structure - Approximate analysis for vertical loading - Approximate analysis for lateral loading - Approximate design of rigid frame buildings-Lateral deformation of rigid frame buildings - Shear wall structure - The vierendeel structure - The hollow tube structure.

UNIT V OTHER HIGH-RISE BUILDING STRUCTURE 9

Deep - Beam systems –High rise suspension systems - Pneumatic high rise buildings - Space frame applied to high risebuildings - Capsule architecture.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Challenges in tall building construction –Construction methods.

TOTAL: 45

TEXT BOOKS

1. Wolfgang Schueller “High - rise building Structures", John Wiley and Sons, 2011.
2. Bryan Stafford Smith and Alex Coull, “Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc.,2009.

REFERENCES

1. Coull, A. and Smith, Stafford, B. "Tall Buildings ", Pergamon Press, London, 2010.

2. LinT.Y. and Burry D.Stotes, "Structural Concepts and Systems for Architects and Engineers", John Wiley, 2008.
3. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 2007.
4. Taranath.B.S., Structural Analysis and Design of Tall Buildings, McGraw Hill 2008.
5. IS 1893(Part 4):2005 Criteria for earthquake resistant design of structures: Part 4 Industrial structures including stack-like structure, BIS,New Delhi.
6. DOC.CED 39(7590) Draft Indian Standard Criteria for earthquake resistant design of structures: Part 4 Industrial structures including stack like structure [First Revision of IS 1893(Part 4)], BIS, New Delhi.
7. IS 875 -1987 Part I, II, III, IV, V Code of practise for design loads (other than Earth Quake) for buildings and structures, BIS, New Delhi.
8. IS 13920-1993, Ductile Detailing of Reinforced Concrete Structures subjected to seismic force - Code of practice, BIS, New Delhi.
9. IS 4326-1993, Earth quake resistant design &construction of building - Code of practice, BIS, New Delhi.

13C025 PREFABRICATED STRUCTURES 3 0 0 3

OBJECTIVES

- To understand the different types of prefabricated elements and the technologies used for fabrication and erection.
- To study the concepts of modular construction and industrialized construction

OUTCOME

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

- Use the different types of prefabricated elements and the technologies used for fabrication and erection in field.

UNIT I INTRODUCTION TO PREFABRICATED STRUCTURES **9**

Need for prefabrication – Principles – Materials – Comparison with monolithic construction Types of prefabrication – Site and plant prefabrication - Economy of prefabrication- Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS **9**

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs- Ribbed floor panels – Wall panels – Columns – Shear walls- Footings- Storage of precast elements – Dimensional tolerances.

UNIT III DESIGN PRINCIPLES **9**

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV JOINT IN STRUCTURAL MEMBERS **9**

Joints for different structural connections – Dimensions and detailing- Effective sealing of joints for water proofing – Provisions for non-structural fastenings – Design of expansion joints.

UNIT V DESIGN FOR ABNORMAL LOADS AND ITS APPLICATIONS **9**

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse-Designing and detailing of precast unit for factory structures – Purlins, roof trusses, lattice girders, gable frames

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Recent trends in prefabrication members - Prefabricated caissons-Prefabricated staircase- Retrofit of concrete members with externally bonded Prefabricated members- - Performance of connections for prefabricated timber–concrete composite floors- Limit analysis of prefabricated large panel buildings by the use of discrete models

TOTAL: 45

TEXT BOOKS

1. Gerald Staib, “Components and Systems: Modular Construction - Design, Structure, New Technologies”,BirkhauserVerlag AG, 1st edition,August 2008
2. Ryan E. Smith, “Prefab Architecture: A Guide to Modular Design and Construction”,John Wiley & Sons, January 2011.

REFERENCES

1. Mark Anderson, “Prefab Prototypes: Site-Specific Design for Offsite Construction”, Princeton Architectural Press,January 2007.
2. Alejandro Bahamon, “PreFab-Prefabricated and Movable Architecture”, HarperCollins Design International, November 2002.

3. Michael Stacey, "Component Design (New Technology)", Architectural Press,1st edition, November 2001
4. IS 875 -1987 Part I, II, III, IV, V Code of practice for design loads (other than Earth Quake) for buildings and structures, BIS, New Delhi.
5. IS 13920-1993, Ductile Detailing of Reinforced Concrete Structures subjected to seismic force – Code of practice, BIS, New Delhi.
6. IS 4326-1993, Earth Quake resistant design &construction of building - Code of practice, BIS, New Delhi.
7. IS 456: 2000 Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi.

13C026 WIND ENGINEERING 3 0 0 3

OBJECTIVES

At the end of the course the student should be able

- To study the concept of forces generated on structures due to normal wind as well as gusts
- To understand the different types of dynamic effects created by these wind forces.

OUTCOMES

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

- Design forces on multistory building.
- Solve the complicated structures.
- Use the basic concepts of wind force and its potential.

UNIT I INTRODUCTION TO WIND ENGINEERING 9

Terminology – Wind data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

UNIT II EFFECT OF WIND ON STRUCTURES 9

Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aero elastic structure (concept only).

UNIT III EFFECT ON TYPICAL STRUCTURES 9

Tall buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

UNIT IV APPLICATION TO DESIGN 9

Design forces on multistorey building, towers and roof trusses.

UNIT V INTRODUCTION TO WIND TUNNEL TESTING 9

Types of models (Principles only) – Basic considerations – Examples of tests and their use.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Analysis and design of structures using Staad Pro. Portal and cantilever methods of analysis for wind force.

TOTAL: 45

TEXT BOOKS

1. Charalambos C, “Wind effects on Building and Design of wind sensitive structures”, Springer wien, New York, 2007.
2. Simiu and Robert H. Scanlan., Wind Effects on Structures, Dover Pubns; 3rd edition,2011

REFERENCES

1. John D.Holmes., “Wind Loads on Structures”, CRC Press; 2nd edition, 2007.
2. Emil Simiu,” Design of building for wind“,Wiley; 2nd edition, 2011.
3. IS 875 -1987 Part I, II, III, IV, V Code of practise for design loads (other than Earth Quake) for buildings and structures, BIS, New Delhi.
4. IS 1893(Part 4):2005 Criteria for earthquake resistant design of structures: Part 4, Industrial structures including stack-like structure,BIS,New Delhi.
5. IS 13920-1993, Ductile Detailing of Reinforced Concrete Structures subjected to seismic force – Code of practice, BIS, New Delhi.
6. IS 4326-1993, Earth Quake resistant design &construction of building - Code of practice, BIS, New Delhi.

13C027 COMPUTER AIDED DESIGN OF STRUCTURES 3 0 0 3

OBJECTIVES

- To learn the fundamentals of CAD, hardwares, softwares and design process
- To Learn about graphic primitives, transformations, wire frame modelling, solid modeling, graphic standards, drafting packages
- To understand the fundamentals of finite element analysis, principles of structural analysis, analysis packages and applications.
- To learn the principles of design of RCC and steel structures, optimisation techniques, algorithms, linear programming and simplex method.
- To understand the Principles of artificial intelligence, expert systems, Rules and decision tables, inference mechanisms..

OUTCOMES

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

- Use the fundamentals of CAD, harwares, Softwares and design process
- Use the graphic primitives, transformations, wire frame modelling, solid modeling, graphic standards and drafting packages.
- Use the fundamentals of finite element analysis, principles of structural analysis in analysis packages and applications.
- Apply the principles of design of RCC and steel structures, optimisation techniques, algorithms, linear programming and Simplex method.
- Apply principles of artificial intelligence, expert systems, rules and decision tables, inference mechanisms.

UNIT I INTRODUCTION TO HARDWARE AND SOFTWARE **9**

Fundamentals of CAD - Hardware and software requirements -Design process - Applications and benefits.

UNIT II COMPUTER GRAPHICS **9**

Graphic primitives - Transformations -Wire frame modeling and solid modeling -Graphic standards – Drafting packages.

UNIT III STRUCTURAL ANALYSIS **9**

Fundamentals of finite element analysis - Principles of structural analysis -Analysis packages and applications.

UNIT IV DESIGN AND OPTIMISATION **9**

Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear programming – Simplex method.

UNIT V EXPERT SYSTEMS **9**

Introduction to artificial intelligence - Knowledge based expert systems -Rules and decision tables – Inference mechanisms - Simple applications.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Introduction to Evolutionary Computations – Evolutionary Algorithms – Evolutionary Design and Theory of Inventive Problem solving

TOTAL: 45

TEXT BOOKS

1. Groover M.P. and Zimmers E.W. Jr., “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India Ltd, New Delhi, 2007
2. Krishnamoorthy C.S., Rajeev S., Raja ramanA.,”Computer Aided Design”, Alpha Science Intl. Ltd, 2006

REFERENCES

1. William Mcguire, Richard H. Gallagher and Ronald D. Ziemian,"Matrix Structural Analysis", Wiley India Pvt Ltd 2012.
2. Singiresu S. Rao, "Engineering Optimization: Theory and Practice", Wiley, 2009.
3. Joseph C. Giarratano& Gary D. Riley, "Expert Systems: Principles and Programming", Course Technology, London, 2004.

13C028 INDUSTRIAL STRUCTURES 3 0 0 3

OBJECTIVES

- To study the general requirements for industries, planning and layout of buildings and components.
- To learn lighting, ventilation, accounts and fire safety for industries.
- To understand the analysis and design procedure of gable portal frame with and without gantry loads, bunkers and silos
- To study the design of RCC bunkers, silos, corbels and nibs
- To understand the principles of prefabrication, prestressed precast roof trusses and Functional requirements for precast concrete units

OUTCOMES

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

- Use general requirements for industries for planning and layout of buildings and components
- Design lighting, ventilation and accounts
- Analysis and design staircases, flat slabs, concrete walls, gable portal frame with and without gantry loads, steel bunkers and silos
- Design RCC bunkers, silos, corbels and nibs
- Use the principles of prefabrication, prestressed precast roof trusses and functional requirements of precast concrete units

UNIT I PLANNING **9**

Classification of industries and industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENTS **9**

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

UNIT III DESIGN OF STEEL STRUCTURES **9**

Industrial roofs – Analysis and design of gable portal frame with and without gantry loads. – Design of bunkers and silos

UNIT IV DESIGN OF R.C. STRUCTURES **9**

Bunkers and silos – Design of corbels and nibs – Principles of folded plates and shell roofs

UNIT V PREFABRICATION **9**

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for precast concrete units – Pre Engineered metal building systems

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Earthquake resistant design of Secondary Structures – Principles of analysis and design of Tall Chimneys – Applications of Object Oriented Programming Language in designing Industrial Structures.

TOTAL: 45

TEXT BOOKS

1. Gambhir. M.L, “Design of Reinforced Concrete Structures”. PHI Learning Pvt. Ltd., 2008.
2. Varghese. P.C, “Advanced Reinforced Concrete Structures”, PHI Learning Pvt. Ltd.2009
3. Subramanian. N, “Design of Steel Structures” Oxford University Press, India, 2008
4. Pasala Dayaratnam, “Design of Steel Structure”, S. Chand Publications, 2008.

REFERENCES

1. Henn W. Buildings for Industry, Vols.I and II, London Hill Books, 1995.
2. SP32 – 1986,,"Handbook on Functional Requirements of Industrial buildings", Bureau of Indian Standards, New Delhi 1990.
3. IS 1893(Part 4):2005 Criteria for earthquake resistant design of structures: Part 4, Industrial structures including stack-like structure,BIS,New Delhi.
4. DOC.CED 39(7590) Draft Indian Standard Criteria for earthquake resistant design of structures: Part 4 Industrial structures including stack like structure [First Revision of IS 1893(Part 4)], BIS, New Delhi.
5. SP 16: 1980 Design Aids for Reinforced Concrete to IS 456: 1978, BIS, New Delhi.
6. SP 34: 1987 Handbook on Concrete Reinforcement and Detailing, BIS,New Delhi
7. IS 456: 2000 Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi.
8. IS 800-2007 General construction in steel – code of practise. BIS, New Delhi.
9. IS 875 -1987 Part I, II, III, IV, V Code of practise for design loads (other than Earth Quake) for buildings and structures, BIS, New Delhi.
10. National Building Code Part1, Part2, Part3, Part4, Part5, and Part6, 2005, BIS, New Delhi.

13C029 MODERN CONSTRUCTION MATERIALS 3 0 0 3

OBJECTIVE

- To study and understand the properties of recent materials used in construction.

OUTCOMES

- Graduate understand the Recent development in construction materials

UNIT I SPECIAL CONCRETES **5**

Concretes, Behaviour of concretes - High Strength and High Performance Concrete – Fibre Reinforced Concrete, Self compacting concrete, Alternate Materials to concrete.

UNIT II METALS **10**

Steels - New Alloy Steels – Aluminum and its Products –Coatings to reinforcement –Applications.

UNIT III COMPOSITES

Plastics –Reinforced Polymers – FRP – Applications **10**

UNIT IV OTHER MATERIALS

Water Proofing Compounds – Non-weathering Materials – Flooring and Façade Materials **10**

UNIT V SMART AND INTELLIGENT MATERIALS

Smart and Intelligent Materials for intelligent buildings **-** Special features **10**

TOTAL: 45

TEXTBOOKS:

1. Santhakumar A.R., Concrete Technology, Oxford University press, New Delhi.2007
2. Shetty M.S, Concrete Technology: Theory and Practice, S.Chand & Company Ltd., 2005.

REFERENCES:

1. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall Inc., 1999.
2. Ashby, M.F. and Jones.D.R.H.H. “Engineering Materials 1: An Introduction to Properties, applications and designs”, Elsevier Publications, 2005.
3. Shan Somayaji, Civil Engineering Materials, Prentice Hall Inc., 2001
4. Aitkens, High Performance Concrete, McGraw Hill, 1999
5. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S, Materials for Civil and Highway Engineers, Prentice Hall Inc., 1998.
6. ACI Report 440.2R-02, “Guide for the design and construction of externally bonded RP systems for strengthening concrete structures”, American Concrete Institute, 2002.

13C030 FINITE ELEMENT TECHNIQUES 3 0 0 3

OBJECTIVE

- To study the concept of finite element techniques for analysis of one and two dimensional problems and applications to field problems.

OUTCOMES

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

- Analyse shape functions for triangular and rectangular elements
- Analysis and design of plate and shell structures using finite element method.

UNIT I ELEMENTS OF ELASTICITY 9

Basic principles of structural mechanics – Equations of equilibrium – Strain displacement relations – Stress strain relations – Plane stress and plane strain cases – Principles of virtual work and minimum potential energy.

UNIT II DIRECT STIFFNESS METHOD 9

Steps in direct method of FEA – Element stiffness matrix – Global stiffness matrix – Boundary conditions – Problems on simple beams and Trusses

UNIT III FINITE ELEMENTS 9

Discretization - Basic element shapes - Element properties – Node numbering procedure –Convergence requirements – Generalised co-ordinates – Natural co-ordinates – Shape functions for linear & quadratic models – Stiffness matrix – Nodal load vector – Static condensation – Simple problems.

UNIT IV INTRODUCTION TO ISOPARAMETRIC ELEMENTS 9

Concept of sub, iso, super parametric elements – Gauss quadrature – Examples in one and two dimensional elements.

UNIT V APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS 9

Equations of elasticity – Plane elasticity problems – Axisymmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Analysis of Truss and RC Element using ANSYS Package

TOTAL: 45

TEXT BOOKS

1. Tirupathi R. Chandrupatla and Ashok D. Belugundu, “Introduction to Finite Elements in Engineering”,Third Edition, Prentice Hall India Pvt Ltd, 2011.
2. Rajasekaran S, “Finite Element Analysis in Engineering Design”. S Chand & Co., 2008.

REFERENCES

1. Krishnamoorthy C.S., “Finite Element Analysis- Theory and Programming”, Second Edition, Tata McGrawHill Publishing Co., 2004.
2. Seshu. P, “Textbook of Finite Element Analysis”, Prentice Hall India Pvt Ltd, 2008.
3. Bhavikati S.S., “Finite Element Analysis”, New Age Intl. Publishers, 2010
4. Lui G R and Quek S S “The Finite Element Method”, MPG Books Ltd, Bodmin, Cornwall, 2003.
5. Rajasekaran S and Sankarasubramanian G, “Computational Structural Mechanics”, Prentice Hall of India Pvt. Ltd, New Delhi, 2006.
6. Krishnamoorthy C S, “Finite Element Analysis – Theory and Programming”, Tata McGraw Hill Publishing Co., New Delhi, 2001.

13C031 REPAIR AND REHABILITATION OF STRUCTURES 3 0 0 3

OBJECTIVES

- To understand the Maintenance and Repair Strategies for damaged structures
- To understand the quality assurance and durability of concrete.
- To understand the different types of special concretes and techniques for repair.
- To understand the Retrofitting and Rehabilitation techniques for structural members
- To study the concept used in various demolition techniques and case studies.

OUTCOMES

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

- Analyze the preventive measures to counteract deterioration of structures
- Use the various visual inspection methods
- Use to their projects experiences of those who have monitored concrete structures over the years and have carried out restoration work

UNIT I MAINTENANCE AND REPAIR STRATEGIES 9

Maintenance, repair and rehabilitation, Facets of maintenance, importance of maintenance various aspects of Inspection, assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II SERVICEABILITY AND DURABILITY OF CONCRETE 9

Quality assurance for concrete construction concrete properties- strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion - Design and construction errors - Effects of cover thickness and cracking.

UNIT III SPECIAL MATERIALS FOR REPAIR 9

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, ferrocement, fibre reinforced concrete.

UNIT IV REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES 9

Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

UNIT V TECHNIQUES FOR REPAIR AND DEMOLITION 9

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. engineered demolition techniques for Dilapidated structures

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Recent development of seismic retrofit methods – reasons and methods

TOTAL: 45

TEXT BOOK

1. Allen.R.T. and S.C.Edwards Repair of Concrete Structures, Spon E & F N, UK, 2003.

REFERENCES

1. Shetty. M.S, Concrete Technology - Theory and Practice, S.Chand and Company, New Delhi, 2009.
2. Vidivelli,B., Rehabilitation of Concrete Strucutres", Standard Publishers Distributors,2007.
3. Santhakumar, A.R., Training Course notes on Damage Assessment and repair in Low Cost Housing , "RHDC-NBO" Anna University, July 1992.

4. Raikar, R.N., Learning from failures - Deficiencies in Design, Construction and Service - R&D Centre (SDCPL), RaikarBhavan, Bombay, 1987.
5. N. Lakshmipathy, M. Senthil.R, Lecture Notes of “Workshop on Repairs and Rehabilitation of Structures", October 1999
6. SP: 25 -1984 – Hand Book on Causes and Prevention of Cracks in Buildings, BIS,New Delhi, 1999.
7. IS 13935 – 1993 Repair and seismic strengthening of building guidelines, BIS, New Delhi.
8. IS 4081:1986 Safety code for blasting and related drilling operations, BIS, New Delhi.
9. IS 4130:1991 Safety code for demolition of buildings, BIS, New Delhi.

13C032 OPTIMIZATION IN ENGINEERING 3 0 0 3

OBJECTIVES

At the end of the course the student should be able

- To study the concept of optimization and its techniques.
- To understand the different types of conventional and non-conventional optimization techniques for engineering applications.

OUTCOMES

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

- Design the cost effective building.
- Solve by using various types of algorithm

UNIT I INTRODUCTION TO OPTIMISATION 9

Basic Concepts of minimum weight – minimum cost design – Objective function, constraints –Brief review of classical methods.

UNIT II INTEGER PROGRAMMING 9

Introduction – Graphical representation – Gomory's cutting plane method – Balas' Algorithm forzero-one programming – Integer polynomial programming – Branch-and-Bound method –Sequential Linear Discrete Programming – Generalized penalty function method.

UNIT III GENETIC ALGORITHM 9

Genetic Algorithms – Operators – Reproduction – Mutation – Cross Over – Evolution Strategies– Methods for optimal design of structures, continuous beams and single storeyed frames –minimum weight design for truss members.

UNIT IV ANT COLONY ALGORITHM 9

Natural motivation – Ant algorithm – Network – The ant – Initial population – Ant movement –Ant tours – Pheromone – Evaporation – Introduction to TABU search – sample problem.

UNIT V ARTIFICIAL NEURAL NETWORK 9

Basic concepts – Biological systems – Artificial neural network – application characteristics –overview of learning methods – Review of probability concepts – Fuzzy set theory and logic.

TOTAL: 45

TEXT BOOKS

1. Rao. S.S. "Engineering Optimization, Theory and Practice", New age International (P)Ltd., New Delhi. Reprint 2002.
2. GoldBerg, D.E., "Genetic Algorithm in Search, Optimization and Machine Learning",Addison – Wesley, 1989.

REFERENCE BOOKS

1. Spunt, L, "Optimum Structural Design", Prentice Hall, New Jersey, 1971.
2. Gary Parker, R and Ronald L, Discrete Optimization", Academic press 1988.
3. David Corns, Marco Dorigo and Fred Gloves, "New Ideas in Optimization",The McGraw Hill Company, London, 1999.
4. Rajasekaran,S and Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm", Prentice Hall of India Pvt. Ltd, Delhi, 2003.

13C033 DESIGN OF SUBSTRUCTURES 3 0 0 3

OBJECTIVES

- To study about the types and purposes of different foundation systems and structures.
- To understand and evaluate the feasibility of foundation solutions to different types of soil conditions.
- To know about the foundations for Coffer dams,

OUTCOMES

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

- Solve problems on shallow and deep foundation.
- Design the foundation structure according to the soil condition.

UNIT I SUB SURFACE EXPLORATION **8**

Purpose - Programme and procedures – Interpretation of bore logs, soil data and exploration reports.

UNIT II SHALLOW FOUNDATIONS **9**

Types of foundations and their specific applications – Depth of foundation – Bearing capacity and settlement estimates – Structural design of isolated footings, strip, rectangular and trapezoidal combined footings – strap– Raft foundation – Approximate flexible method of raft design.

UNIT III DEEP FOUNDATIONS **9**

Types of piles and their applications - Load capacity - Settlements - Group action - Design of piles and pile caps.

UNIT IV FOUNDATIONS FOR OTHER MISCELLANEOUS STRUCTURES **9**

Caissons and well foundations - Foundations for towers –Braced cuts-Coffer dams.

UNIT V MACHINE FOUNDATION **10**

Types - General requirements and design criteria - General analysis of machine-foundations-soil system - Stiffness and damping parameters - Tests for design parameters - Guide lines for design of reciprocating engines, impact type machines, rotary type machines, framed foundations.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Analysis and design of piers - Abutments and Retaining walls - Well foundations.

TOTAL: 45

TEXT BOOKS

1. Thomlinson, M.J. and Boorman. R. “Foundation Design and Construction”, ELBS Longman VI edition, 2003.
2. Nayak, N.V., “Foundation Design manual for Practicing Engineers”, DhanpatRai and Sons, 1982

REFERENCES

1. Winterkorn H.F., and Fang H.Y., “Foundation Engineering Hand Book - Van Nostrard - Reinhold - 1976.
2. Kurian, N.P., “Design of Foundation Systems: Principles and Practices,” (3rd rev. and
3. enl. edn.) Narosa Publishing house, New Delhi, 2005.
4. IS 1080:1985 Code of practice for design and construction of shallow foundations in soils (other than raft, ring and shell) (second revision), 2007.
5. IS 1888:1982 Method of load test on soils (second revision), 2007.
6. IS 1892:1979 Code of practice for subsurface investigation for foundations, 2007
7. IS 2131:1981 Method of standard penetration test for soils, 2007.

8. IS 2810:1979 Glossary of terms relating to soil dynamics, 2007.IS 2911(Part 2):1980 Code of practice for design and construction of pile foundations: Part 2 Timber piles, 2005.
9. IS 2974(Part 1):1982 Code of practice for design and construction of machine foundations: Part 1 Foundations for reciprocating type machines, BIS, New Delhi.
10. IS 2974(Part 2):1980 Code of practice for design and construction of machine foundations: Part 2 Foundations for impact type machines (hammer foundations), BIS, New Delhi.
11. IS 2974(Part 3):1992 Code of practice for design and construction of machine foundations: Part 3 Foundations for rotary type machines (Medium and high frequency), BIS, New Delhi.
12. IS 2974(Part 4):1979 Code of practice for design and construction of machine foundations: Part 4 Foundations for rotary type machines of low frequency, BIS, New Delhi.
13. IS 2974(Part 5):1987 Code of practice for design and construction of Machine foundations Part 5 Foundations for impact machines other than hammer (forging and stamping press, pig breaker, drop crusher and jolter , BIS,New Delhi.

13C034 GEOTECHNICAL EARTHQUAKE ENGINEERING 3 0 0 3

OBJECTIVES

- To learn the practice of geotechnical earthquake engineering from the perspective of a practitioner.
- To study the impact of seismic behaviour of soils (site response and liquefaction) on the seismic hazard at a site.
- To understand the necessary background to the seismic design and assessment of foundations and earth structures and their interaction with structure design.
- To study the application of analysis techniques in the geotechnical risk assessment.

OUTCOMES

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

- Analyse practical problems involving seismic hazard assessment.
- Design Geotechnical structures as part of construction projects in seismically active areas.

UNIT I INTRODUCTION TO EARTHQUAKE ENGINEERING **9**

Scope - Objective – Nature and types of earthquake loading – Importance of geotechnical earthquake engineering - Concept of dynamic load – Earthquake load - Single degree of freedom system - Multiple degree of freedom system - Free and forced vibrations - Damped and undamped systems - Equation of motion - Response spectra.

UNIT II ENGINEERING SEISMOLOGY **9**

Engineering Seismology – Earthquake – Causes and source of earthquake – Elastic rebound theory – Faults - Plate tectonics - Seismograph and seismogram - Prediction of earthquakes - Protection against earthquake damage - Origin of universe - Layers of earth - Theory of continental drift - Hazards due to earthquakes.

UNIT III GROUND MOTION AND WAVE PROPAGATION **9**

Magnitude and intensity of earthquake – Modified mercalli Intensity Scale - Measuring of earthquake - Earthquake magnitude - Local (Richter) magnitude. Spectral Parameters: Peak acceleration – Peak velocity - Peak displacement - Frequency content and duration - Elastic response of continua (one, twoand three dimensional wave equations) – Waves in unbound, semi – infinite, layered media. Mohorovicic discontinuity and Gutenberg discontinuity.

UNIT IV DYNAMIC SOIL PROPERTIES **9**

Stiffness - Damping and plasticity parameters of soil and their determination (laboratory testing, intrusive and nonintrusive in-situ testing); Correlations of different soil parameters - Liquefaction (basics, evaluation and effects) - Liquefaction hazard map - Lateral spreading.

UNIT V SEISMIC HAZARD ANALYSIS **9**

Magnitude indicators – Segmentation - Deterministic seismic Hazard Analysis (DSHA) - Probabilistic Seismic Hazard Analysis (PSHA) - Earthquake source characterization - Gutenberg-Richter recurrence law – Predictive relationships - temporal uncertainty - Probability computations – Seismic hazard Curve logic tree methods.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Soil Dynamics - Geotechnical failure of foundations during earthquake - Earthquake resistant design of shallow foundation - Earthquake resistant design of pile foundation - Liquefaction and remedial measures.

TOTAL: 45

TEXT BOOKS

1. IkuoTowhata, “Geotechnical Earthquake Engineering”, Springer-Verlag Heidelberg,2010.
2. MilutinSrbulov, “Geotechnical Earthquake Engineering: Simplified Analyses with Case Studies and Examples”, Springer-Verlag,2008.
3. Barkan. D. D, “Dynamics of Bases and Foundations”, McGraw-Hill Book Company,2010.

REFERENCES

1. Steven L. Kramer, “Geotechnical Earthquake Engineering”, Prentice Hall Inc,1996.
2. Robert W. Day, “Geotechnical Earthquake Engineering Handbook”, McGraw Hill, New York,2001.
3. Kenji Ishihara, “Soil Behaviour in Earthquake Geotechnics”, Oxford University Press, USA,1996.
4. IS 1893:1984, Indian Standard Criteria for earthquake resistant Design of Structures.

SEMESTER - III

13C301 FOURIER ANALYSIS AND MATHEMATICAL STATISTICS 3 1 0 4

OBJECTIVES

- To study the concept of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- To understand the different possible forms of Fourier series and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
- To study the concept of boundary value problems and transform techniques which will be necessary for the effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory.
- To study the concept of fitting a curve of best fit to the given numerical data and to calculate the deviation of the expected value from the observed value.
- To learn the working method for determining the extent to which the quality goals are being met without checking every item produced.

OUTCOMES

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

- Solve the engineering problems using PDE
- Find Fourier series solution to the engineering problems
- Use the concept of quality control chart for quality assessments.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **9**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions- Solution of standard types of first order partial differential equations- Lagrange's linear equation – Linear homogeneous partial differential equations of second and higher order with constant co-efficient

UNIT II FOURIER SERIES **9**

Dirichlet's conditions- General Fourier Series – Odd and Even Functions- Half range sine and cosine series – Change of Interval - Parseval's Identity- Harmonic analysis

UNIT III BOUNDARY VALUE PROBLEMS **9**

Classification – solution of one dimensional wave equation – one dimensional heat equation – steady state solutions of two dimensional heat equations (excluding insulated edges) – Fourier series solution in Cartesian coordinates

UNIT IV CURVE FITTING, CORRELATION AND REGRESSION **9**

Empirical laws and curve fitting – linear law – method of group averages – principle of Least squares – fitting straight line, parabola, exponential curve – Covariance-Correlation coefficient-properties-Regression lines-properties.

UNIT V STATISTICAL QUALITY CONTROL **9**

Quality control charts -quality variations-Variables and attributes-basics of control charts-warning limits – control charts for variables - - R chart- control charts for attributes – C chart - P chart for fraction defectives - np chart - chart -Advantage of control chart

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Modeling of heat and mass transfer equation using PDE – Forecasting analysis – Applications of statistical quality control charts – six sigma procedures - Geostatistics to soil quality assessment.

TUTORIAL: 15

TOTAL: 60

TEXT BOOKS

1. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, 2007.
2. Gupta, S.C, and Kapur, J.N., "Fundamentals of Mathematical Statistics", Sultan Chand, Ninth Edition , New Delhi ,1999.

REFERENCES

1. Kreyszig. E, " Advanced Engineering Mathematics", Eighth Edition, John Wiley and Sons (Asia) Limited, Singapore 2001.
2. Venkataraman. M.K, "Engineering Mathematics", Volume I & II Revised Enlarged Fourth Edition",The National Pub. Co., Chennai, 2004.

13C302 APPLIED GEOLOGY AND ENGINEERING MATERIALS 3 0 0 3

OBJECTIVES

- To understand the nature of earth materials, types of rocks and their structure.
- To know about the construction materials and their importance in Civil Engineering.

OUTCOMES

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

- Identify different rocks and its structures.
- Analyse the rocks during the construction of tunnels, dams and road cuttings.

UNIT I INTRODUCTION **9**

Geology in Civil Engineering - Branches of geology - Scope - Earth structures and composition - Elementary knowledge on continental drift and plate technologies. Earth processes - Weathering - Types - Geological work of wind, river - Engineering considerations. Ground water - Deposition - Mechanical work.

UNIT II PETROLOGY AND STRUCTURAL GEOLOGY **9**

Types of Rocks - Sedimentary - Metamorphic and Igneous - Attitude of beds – Outcrops – Introduction to Geological maps – Study of structures – Folds, faults and joints – Their bearing on engineering construction - Seismic and Electrical methods for Civil Engineering investigations.

UNIT III GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING **9**

Remote sensing techniques – Study of air photos and satellite images – Interpretation for Civil Engineering projects – Geological conditions for construction of Dams, Tunnels, Buildings, Road cuttings, Land slides – Causes and preventions. Sea erosion and coastal protection.

UNIT IV CONSTRUCTION MATERIALS **9**

Timber – Types of timber – Defects in timber – Seasoning of timber – Timber products. Steel – Structural steel – Rebar - Rusting and corrosion - Tensile testing of steel. Aluminium – Properties – Applications in construction. Glass – Types – Selection of glass for various applications – Engineering properties of glass.

UNIT V ADMIXTURES AND SMART MATERIALS **9**

Mineral and chemical admixtures – Fly ash, Silica fume, Metakaoline, GGBS, Super plasticizers. Smart materials – Piezoelectric materials, Optical fibres.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Hydrogeology – Water/Earth interactions – Soil and ground water zones – Ground water as a geologic agent

TOTAL: 45

TEXT BOOKS

1. Parbin Singh, “Engineering and General Geology”, K Kataria & Sons, New Delhi, 2010.
2. Shetty M S, “Concrete Technology -Theory and Practice”, S Chand and Company, 2009.
3. D V Reddy,” Applied Geology”, Vikas Publishers,2010

REFERENCES

1. Arora S P and Bindra S P, " A Text Book of Building Construction”, DhanpatRai and Sons, New Delhi, 2013.
2. Mel. M Schwartz, Encyclopedia of Smart Materials, John Wiley and Sons inc. 2002.

B.E:CIVIL ENGINEERING

13C303 MECHANICS OF SOLIDS 3 1 0 4

OBJECTIVES

- To study the concept of stress, strain and deformation of solids.
- To understand the different types of plane truss, thin cylinders and shells.
- To understand the bending moment and shear force diagram for different types of beams.
- To study the deflection of beams and shear stresses.
- To understand about the torsion and springs.

OUTCOMES

At the end of the course the students should be able to

- Use the concepts of stress and strain in simple problems
- Analyse the different types of beams with different loads and end conditions.
- Analyse the beams and trusses by different methods
- Solve the problems on thin cylinders /shells
- Solve the problems in basics of deflection, torsion and spring

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS **9**

Rigid bodies and Deformable solids – Stability, strength, stiffness – Tension, Compression and Shear stresses – Strain, Elasticity, Hooke's law, Limit of proportionately, Modules of Elasticity, Stress-Strain curve, Lateral Strain – Temperature Stresses – Deformation of simple and compound bars – Shear modulus, Bulk modulus, Relationship between elastic constants .

UNIT II TRANSVERSE LOADING ON BEAMS **9**

Beams – Types of supports – Simple and fixed, types of loads – Concentrated, uniformly distributed, varying distributed load, combination of above loading – Relationship between bending moment and shear force – Bending moment, shear force diagram for simply supported, cantilever and over hanging beams .

UNIT III ANALYSIS OF PLANE TRUSS, THIN CYLINDERS / SHELLS **9**

Stability and equilibrium of plane frames – Types of trusses – Analysis of forces in truss members method of joints, method of sections, method of tension coefficients – Thin cylinders and shells under internal pressure – Deformation of thin cylinders and shells.

UNIT IV BENDING OF BEAMS,TORSION AND SPRINGS **9**

Bending of beams-Bending stress- shear stress -Stresses and Deformation in circular (solid and hollow shafts) – Stepped shafts – Shafts fixed at both ends – Leaf springs – Stresses in helical springs – Deflection of springs.

UNIT V DEFLECTION OF BEAMS **9**

Deflection of beams – Double integration method – Macaulay's method – Slope and deflection using Moment Area method, Conjugate Beam method

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Energy method-Theories of failure -Advanced theory of bending- Fatigue- Fracture

TUTORIAL: 15
TOTAL: 60

TEXT BOOK

1. Rajput, R.K "Strength of Materials", S Chand & Company Ltd., New Delhi, 2006.

REFERENCES

1. Timoshenko, “Strength of Materials”, D.VAN NOSTRAND COMPANY Inc,New York.
2. Bansal ,R.K., “Strength of Materials:, Laxmi Publications, New Delhi, 2010
3. Basavarajaiah , “Strength of Materials”, B. S. Basavarajaiah, P. Mahadevappa,Unviversity Press,2010.

13C304 MECHANICS OF FLUIDS 3 1 0 4

OBJECTIVES

- To study about the properties of fluid, principles of fluid statics, kinematics and dynamics.
- To understand the application of similitude and model study.

OUTCOMES

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

- Analyse properties of fluids, principles of fluid statics, kinematics and dynamics
- Analyse flow through pipes, pipe network and boundary layer concepts
- Use similitude and model study

UNIT I DEFINITIONS AND FLUID PROPERTIES **9**

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum concept of system and control volume

UNIT II FLUID STATICS & KINEMATICS **9**

Pascal's Law and hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Meta centre – Pressure measurement – Fluid mass under relative equilibrium- Fluid Kinematics Stream, Streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – Flow nets.

UNIT III FLUID DYNAMICS **9**

Euler and Bernoulli's equations – Application of Bernoulli's equation - Velocity measurement (Pitot tube, current meter, float technique) – Discharge measurement – Reynolds Experiment - Laminar flows through pipes– Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Moody diagram – Momentum principle

UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES **9**

Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes – Pipes in series and in parallel – Pipe network.

UNIT V DIMENSIONAL ANALYSIS **9**

Dimensional Analysis – Rayleigh's method, Buckingham's Pi-theorem – Similitude and models – Scale effect and distorted models.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Hot wire anemometry- Laser flow anemometry- Flow visualization techniques- Introduction to ideal fluid flow

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Jain A.K., "Fluid Mechanics including Hydraulic Machines", Khanna Publishers,2010
2. Modi P.N & Seth S.M ,"Hydraulics & Fluid Mechanics", Standard book house, New Delhi, 2009.
3. Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2007.
4. Kumar K.L., "Engineering Fluid Mechnics", S.Chand & Company Ltd. New Delhi, 2009

REFERENCES

1. Rajput, R K, “A text book of Fluid Mechanics", S Chand & Co., New Delhi, 2007.
2. Robert W and Macdonald, Alan, T, “Introduction to Fluid Mechanics”, John Wiley & Sons, 2009.
3. Mohhanty A K, ‘Fluid Mechanics’ Second Edition, Prentice Hall of India Private Limited, New Delhi, 2007.
4. Streeter, Victor L. and Wylie B.E., “Fluid Mechnics”, McGraw Hill Ltd., 2010.

13C305 CONSTRUCTION TECHNOLOGY 3 0 0 3

OBJECTIVES

- To understand the various construction techniques, practices.
- To understand the different types of equipments needed for construction activities.
- To understand the method of construction of RCC work.

OUTCOMES

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

- Plan a building and select appropriate sites for construction
- Use the various types of bonds, construction equipments and safety aspects in construction

UNIT I SITE PLANNING **9**

Precautions in selection of sites – The situations and surroundings of site for various types of building – elements of building planning, requirements, orientation, ventilation and lighting, concept of green buildings.

Foundation: Setting out foundation plan on ground – Concept of foundation – Bearing capacity of a good foundation – Types of foundation and their construction – Suitability – Methods of timbering of trenches – Foundation failures and remedial measures.

UNIT II BRICK AND STONE MASONRY **9**

Types of bond in brickwork and their suitability – General principles and precautions in brick masonry – factors affecting thickness of walls - Construction of brick masonry – Methods of bonding new brick work with old brick work. Comparison of brick and stone masonry - Strength of brick masonry — Classification of stone masonry– General principles and precautions in stone masonry – Specification and construction of stone masonry – Composite masonry – Lifting appliances – Concrete hollow block masonry.

UNIT III ROOFS AND FLOORS **9**

Roof covering materials – Specifications for laying Mangalore Tiles, Asphalt roofing sheets, Asbestos cement sheets – Aluminum sheets and GI sheets. Accessories for drainage works– shapes of gutters and their sizes. Different types of supporting trusses for the roofing sheets – Timber and concrete roofs – Different types of floors, suitability and construction of floors and floor finishes – Anti-termite Treatment.

UNIT IV DOORS, WINDOWS AND STAIRCASES **9**

Different types of doors and windows and their suitability, Timber, steel, Aluminium and Synthetic. Stair and staircases: Concepts – requirements of a good stair – classification of stairs according to their layout and materials of construction **-**Techniques of plastering – types of rendering – types of pointing and their suitability – Application of paints for new and old work of timber, steel and plaster – preparation and application of white washing and distempering – weathering course **-** Damp proofing

UNIT V R.C.C. WORK **9**

Methods of Construction of R.C.C. slabs, Beams and Columns. Expansion joints- Types and provision of expansion joints for foundations, floors, walls, roofs, beams and slabs- Shoring, Scaffolding and Underpinning Methods, uses and suitability of different types and precautions for safety – Selection of equipment for earth work, concreting, material handling and erection of Structures.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Recent techniques in concrete repair – Damage assessment techniques for fire damaged structures

TOTAL: 45

TEXT BOOKS

1. Rangwala S.C., Building Construction, Charotar Book Stall, Anand, 2012
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, DhanpatRai and Sons, New Delhi 2010.

REFERENCES

1. Shetty M S, "Concrete Technology", S Chand and Co., Ltd., New Delhi, 2009.
2. Deodhar .S.V, “Construction Equipment and Job Planning. Edition: 3rd edition, 2007.
3. Punmia B.C., A Text Book of Building Construction, A Saurabh & Co (P) Ltd., New Delhi, 2008.
4. Sushil Kumar, “Building Construction”, Standard Publishers, New Delhi, 2010.
5. National Building Code of India,BIS:2005.

13C306 SURVEYING I 3 0 0 3

OBJECTIVE

- To study the concept of different types of surveying such as chain surveying, compass surveying, plane table surveying, levelling, theodolite and tacheometric surveying.

OUTCOMES

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

- Use the various methods for measurement of horizontal and vertical distance
- Analyse contour maps and calculate volume of earth work

UNIT I INTRODUCTION AND CHAIN SURVEYING 9

Definition - Principles - Classification - Conventional signs - Chain survey – Instruments-tape corrections - Uses of cross staff and optical square - Chaining and ranging- Field book - Plotting - Errors in chain survey- Obstacles in chaining - Chaining on sloping ground - Calculation of area by trapezoidal and simpson's rule

UNIT II COMPASS AND PLANE TABLE SURVEYING 9

Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction - Magnetic declination - Dip - Traversing - Plotting - Adjustment of errors by and methods - Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing.

UNIT III LEVELLING AND APPLICATIONS 9

Levels and Staves – Sensitiveness of bubble - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs.

UNIT IV THEODOLITE SURVEYING 9

Theodolite - Description and uses - Temporary and permanent adjustments of vernier transit - Measurement of horizontal angles and vertical angles - Traversing - Closing error and distribution - Gale's tables – Total station- Omitted measurements

UNIT V TACHEOMETRIC SURVEYING 9

Tachometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Subtense bar

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Modern equipments for surveying - Electronic distance measurement – Electromagnetic waves – Modulation- Carrier waves- Electronic theodolites – GPS - Mine surveying

TOTAL: 45

TEXT BOOKS

1. Punmia B C, "Surveying", Vol. I and II, Laxmi Publications (P) Ltd., New Delhi, 2005.
2. Kanetkar T.P., Surveying and Levelling, Vols. I and II, Standard Publishers Distributors, New Delhi 2008.

REFERENCES

1. Duggal R K, "Surveying", Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2013.
2. Bannister A and Raymond S, "Surveying", Addison Wesley Longman ltd, England,2006.
3. Basak. N.N. Tata McGraw Hill Publishing Company Ltd., NewDelhi,2001.

13C311	CONSTRUCTION MATERIALS LABORATORY	0	0	3	1

OBJECTIVE

- To study various properties of building materials

LIST OF EXPERIMENTS

I)Tests on cement

1. Fineness
2. Normal consistency and Setting time
3. Soundness
4. Compressive strength

II)Test on bricks

1. Water absorption
2. Efflorescence
3. Compressive strength

III) Tests on aggregate for concrete

1. Grain size distribution
2. Specific gravity
3. Density
4. Void ratio
5. Bulking of sand.
6. Aggregate crushing strength test

IV) Tests on Tiles

1. Transverse strength
2. Water Absorption of
   i) Flooring tiles ii) Roofing tiles.

TOTAL: 45

13C312 STRENGTH OF MATERIALS LABORATORY 0 0 3 1

OBJECTIVES

- To understand the fundamental modes of loading of structures.
- To make measurements of loads, displacements and strains.
- To learn the working of deflectometer, extensometer, compressometer and strain gauges.
- To practically determine the hardness of the materials.

LIST OF EXPERIMENTS

1. Test involving axial compression to obtain the stress – strain curve
2. Test involving axial tension to obtain the stress – strain curve and the strength
3. Test involving torsion to obtain the torque versus angle of twist and hence the stiffness
4. Test involving flexure to obtain the load deflection curve and hence the stiffness
5. Compression test of wood specimen
6. Tests on springs
7. Hardness tests
8. Shear test
9. Test for impact resistance
10. Study of deflectometer, extensometer, compressometer and strain gauges.

TOTAL: 45

13C313	SURVEY PRACTICES I	0	0	3	1

OBJECTIVES

- To study the basic concepts of chain, compass, plane table and theodolite surveying.
- To understand the different types of levels and leveling staff.
- To understand concepts of contour maps preparation and calculation of earth work.

LIST OF EXPERIMENTS

1. Study of chains and its accessories
2. Chain Traversing
3. Compass Traversing
4. Plane table surveying: Resection –Three point problem
5. Plane table surveying: Resection – Two point problem
6. Study of levels and levelling staff
7. Fly levelling using Dumpy level
8. Fly levelling using tilting level
9. Check leveling
10. Block Contouring
11. Longitudinal Sectioning and Cross Sectioning
12. Study of theodolite
13. Measurement of horizontal angles by reiteration and repetition
14. Measurement of vertical angles

TOTAL: 45

SEMESTER - IV

13C401 NUMERICAL METHODS 3 1 0 4

OBJECTIVES

- To study the concept of calculating the roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- To study the concept of constructing approximate polynomial to represent the given numerical data and to find the intermediate values.
- To learn the methods of finding the solution of ordinary differential equations and partial differential equations as most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations.

OUTCOMES

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

- Find the numerical solutions of nonlinear (algebraic or transcendental) equations, simultaneous equations.
- Use numerical methods to solve differential equations and partial differential equations.
- Solve integral equations numerically.

UNIT I SOLUTIONS OF EQUATIONS 9

Solutions of non linear equations by Iteration method, Regula - Falsi method and Newton Raphson method – Solutions of linear system of equations by Gauss Elimination, Gauss Jordan, Gauss Jacobian and Gauss Seidel methods – Inverse of a matrix by Gauss Jordan.

UNIT II INTERPOLATION AND APPROXIMATION 9

Equal Intervals - Newton's Forward and Backward difference formulas - Unequal intervals - Newton's' Divided difference formula , Lagrangian and inverse Lagrangian polynomials.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Newton's Forward and Backward Differences to compute derivatives- -Trapezoidal rule – Simpson's 1/3 rule, Simpson's 3/8 rule (both Single and Double integral) -– Two and three point Gaussian quadrature formulas.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Taylor series method- Euler and modified Euler method – Fourth order Runge-Kutta method for solving first order equations- Milne's and Adam's Predictor and Corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference solution of second order ordinary differential equations- Finite difference solutions of one dimensional heat equation – Bender - Schmidt method – Crank Nicolson method - One dimensional wave equation -Two dimensional Laplace and Poisson equations.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Solutions of transcendental and algebraic equations – differential equations – integral equations using mathematical software.

TUTORIAL:15
TOTAL: 60

TEXT BOOKS

1. Grewal, B.S., Numerical methods in Engineering and Science. 7th edition, Khanna Publishers, 2005.
2. VenkataramanM.K, “Numerical Methods”, National Publishing Company, 2000.

REFERENCES

1. Rajasekaran S., Numerical methods in Science and Engineering – A Practical Approach, 2nd edition,Wheeler Publishing, 1999.
2. Jain M.K. Iyengar, K & Jain R.K., “Numerical Methods for Scientific and Engineering Computation”, New Age International (P) Ltd, Publishers 2003.

13C402 ENVIRONMENTAL ENGINEERING - I 3 0 0 3

OBJECTIVES

- To study the fundamentals of water supply schemes
- To understand the basics and importance of water quality and quantity
- To learn the physicochemical processes of water treatment
- To study the function of transmission mains, methods of water supply, functions of service and storage reservoirs

OUTCOMES

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

- Plan a complete water supply scheme
- Quantify the sources of water and elucidate the major physical, chemical and biological characteristics of clean fresh water
- Design water treatment units and solve the issues of trace organics contamination in potable water supply
- Analyze the water distribution networks

UNIT I FUNDAMENTALS OF WATER SUPPLY **9**

Planned water supply schemes-Importance, planning and execution-Various types of water demands-Variations in demand patterns-Design period-Population forecasting methods-Essential water quality parameters-Analysis and standards.

UNIT II SURFACE AND SUBSURFACE SOURCES **9**

Quality and quantity of surface sources of water-Hydrological concepts-Runoff estimation-Quality and quantity of subsurface sources of water-Infiltration wells and infiltration galleries-Elemental hydrology to compute impounded storage requirements-Mass curve analysis-Intake structures-Types and principles.

UNIT III TREATMENT OF WATER **9**

Unit operations and unit processes of water treatment-Principles, functions and design of flash mixers, coagulation and flocculation units, sedimentation tanks and sand filters- Principles of disinfection-Water softening, aeration, iron and manganese removal-Fluoride removal and demineralization.

UNIT IV TRANSMISSION OF WATER **9**

Hydraulics of pipe flow -Various types of conduits- Materials for conduits- Laying, jointing and testing of pipes- - Leak detection-Corrosion control-Lining of pipes-Appurtenances of pipes-Types of pump and selection of pumps-Calculation of head and horsepower

UNIT V STORAGE AND DISTRIBUTION OF WATER

Distribution network- Methods of distribution system- Analysis of distribution networks using Hardy cross method and equivalent pipe method Service reservoirs- Functions and classification

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Computer Models: Exposure to computer models for surface water quality and groundwater quality

TOTAL: 45

TEXT BOOKS

1. Garg, S.K., Environmental Engineering, Vol.I, Khanna Publishers, New Delhi, 2010
2. Duggal, K. N., Elements of Environmental Engineering, S.Chand Publishers, New Delhi, 2008.
3. Peavy S W, Rowe D R and Tchobanoglous G, "Environmental Engineering", Tata McGraw Hill, 2013.

REFERENCES

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India 2012

13C403 STRENGTH OF MATERIALS 3 1 0 4

OBJECTIVES

- To study the energy concepts and to find deflections of structural elements.
- To study about bending moment and shear force in propped, fixed and continuous beams
- To learn the types of deflection of statically determinate beams, ideal columns and real columns.
- To understand various theories of failure and state of stress in three dimensions.
- To understand advanced concepts like unsymmetrical bending, stresses in curved bars and locating shear centre

OUTCOMES

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

- Analyse different types of beams for calculating deflection.
- Design beams and columns
- Analyse stress distribution in thick cylinders
- Analyse the various types of failures
- Use the concept of fatigue and fracture

UNIT I ENERGY PRINCIPLES **9**

Strain energy and strain energy density – Strain energy in traction, shear in flexure and torsion – Castigliano's theorems – Principle of virtual work – Application of energy theorems for computing deflections in beams and trusses

UNIT II INDETERMINATE BEAMS **9**

Propped cantilever and fixed beams - Fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) – Theorem of three moments – Analysis of continuous beams – Shear force and bending moment diagrams for continuous beams.

UNIT III COLUMNS AND THICK CYLINDERS **9**

Eccentrically loaded short columns – Middle third rule – Core section – Columns of unsymmetrical sections – (angle channel sections) – Euler's theory of long columns – Critical loads for prismatic columns with different end conditions; Rankine-Gordon formula - Eccentrically loaded columns – Thick cylinders – Compound cylinders

UNIT IV STATE OF STRESS IN THREE DIMENSIONS **9**

Spherical and deviatory components of stress tensor - Determination of principal stresses and principal planes – Volumetric strain – Dilatation and distortion – Theories of failure – Principal stress dilatation – Principal strain – Shear stress – Strain energy and distortion energy theories – Application in analysis of stress, load carrying capacity and design of members.

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS **9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre-Curved beams – Winkler Bach formula – Stress concentration – Fatigue and fracture-Elementary Treatment

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Deflection of determinate beams - Governing differential equation – Macaulay's method - Shear centre for thin walled beam cross section

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Punmia .B .C, Ashok Jain and Arun Jain "Strength of Materials and Theory of Structures" –Vol.1, Laxmi Publications, New Delhi, 2013.
2. Rajput .R.K "Strength of Materials" S. Chand & company Ltd, New Delhi, 2008.
3. Srinath,L.S., Prakash Desayi, Srinivasa Murthy.N., and Anantha Ramu .S , "Strength of Materials", Macmillan India Limited,2000.
4. Kazmi.S.M.A., Solid Mechanics,Tata McGraw Hill Publishing Company Limited., New Delhi,2008.

REFERENCES

1. Egor. P.Popov ,"Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2006.
2. Hearn E J, "Mechanics of Materials" Vol I, Butterworth-Heinemann. Oxford, 2008.
3. Bedi D S, "Strength of Materials", Khanna book publishing Co. Ltd., New Delhi, 2008.

13C404 APPLIED HYDRAULIC ENGINEERING 3 1 0 4

OBJECTIVES

- To understand the concept of open channel flow characteristics including hydraulic jump and surges.
- To study the concepts of hydraulic machines viz flow through turbines and pumps including their performance characteristics and design aspects.
-

OUTCOMES

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

- Analyse open channel flow including hydraulic jumps and surges
- Design of hydraulic machines

UNIT I OPEN CHANNEL FLOW **9**

Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel –Uniform flow – Velocity measurement – Manning's and Chezy's formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections – Non-erodible channels

UNIT II GRADUALLY VARIED FLOW **9**

Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions- Specific energy – Critical flow and its computation

RAPIDLY VARIED FLOW

Hydraulic jump – Types – Energy dissipation – Surges – Surge channel transitions

UNIT III IMPACT OF JET ON VANES AND RECIPROCATING PUMP **9**

Application of momentum principle – impact of jets on plane and curved plates - positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels -indicator diagram and its variation - savings in work done - rotary pumps.

UNIT IV TURBINES **9**

Application of momentum principle – Impact of jets on plane and curved plates - Turbines - Classification - Radial flow turbines - Axial flow turbines – Impulse and Reaction turbines - Draft tube and cavitations - Performance of turbines

UNIT V CENTRIFUGAL PUMP **9**

Centrifugal pump - Minimum speed to start the pump – Multistage Pumps – cavitations – specific speed-characteristics - Jet and submersible pumps.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Hydraulic press – Hydraulic ram - Hydraulic accumulator – Hydraulic intensifier – Hydraulic crane – Hydraulic torque converter

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Modi P.N & Seth S.M ,"Hydraulics & Fluid Mechanics", Standard book house, New Delhi, 2009.
2. Jain A.K., "Fluid Mechanics including Hydraulic Machines", Khanna Publishers,2010

REFERENCES

1. Bansal R K, “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications, New Delhi, 2007.
2. Rajput, R K, “A text book of Fluid Mechanics", S Chand & Co., New Delhi, 2007.
3. Subramanya.K, ”Flow in open channels”, Tata McGraw Hill publishing company 3rd Edition, 2008.
4. Mohhanty A K, ‘Fluid Mechanics’ Second Edition, Prentice Hall of India Private Limited, New Delhi, 2007.
5. James A Fay, “Introduction to Fluid Mechanics”, Prentice Hall of India Private Limited, New Delhi, 2007.
6. Yunus A Cengel, John M Cimbala, “Fluid Mechanics – Fundamentals and Applications”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.

13C405 SURVEYING II 4 0 0 4

OBJECTIVES

- To study the concepts of engineering surveys, control survey, survey adjustments, astronomical survey and hydrographic survey
- To understand the setting out of different types of curves

OUTCOMES

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

- Design and set out curves and engineering projects
- Use the various methods for control surveying, survey adjustments, astronomical survey and hydrographic survey

UNIT I ENGINEERING SURVEYS AND SETTING OUT OF SIMPLE CURVE 12

Reconnaissance, preliminary and location surveys for engineering projects - Lay out - Setting out works - Route Surveys for highways, railways and waterways - Tunnels - Correlation of under ground and surface surveys - Simple curves - Setting with chain and tapes, tangential angles by theodolite, double theodolite.

UNIT II SETTING OUT OF COMPOUND, REVERSE, TRANSITION AND VERTICAL CURVES 12

Compound curve –Setting out - Reverse curves – Types - Transition curves - Functions and requirements- Calculation of length of transition curve- Super elevation - Setting out by offsets and angles vertical curves – Types- Setting out of vertical curve - Sight distances

UNIT III CONTROL SURVEYING 12

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Baseline - Instruments and accessories - Satellite station - Reduction to centre –Trilateration - Trigonometric leveling - Single and reciprocal observations

UNIT IV SURVEY ADJUSTMENTS 12

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - Weighted observations - Principle of least squares - Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks.

UNIT V ASTRONOMICAL AND HYDROGRAPHIC SURVEYING 12

Astronomical terms and definitions - Apparent altitude and corrections - Celestial co-ordinate systems - Nautical almanac - Field observations and calculations for azimuth - Hydrographic Surveying - Tides - MSL - Sounding methods - Location of soundings and methods - Three point problem - Strength of fix - Sextants and station pointer .

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Determination of time , latitude and longitude by astronomical observations - Photogrammetric surveying – Stereoscopy - Parallax bar - Introduction to GIS

TOTAL: 60

TEXT BOOKS

1. Kanetkar T.P., Surveying and Levelling, Vols. I and II, Standard Publishers Distributors,New Delhi 2008.
2. Punmia B.C., Surveying, Vols. I, II and III, Laxmi Publications, 2005.

REFERENCES

1. Duggal R K, “Surveying”, Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2013.
2. Chandra A M, "Higher Surveying", New Age International Pvt Ltd., New Delhi, 2005.

13C406 BASIC STRUCTURAL DESIGN 3 1 0 4

OBJECTIVES

- To learn working stress method and limit state method, structural loads.
- To study about the design of riveted and bolted connections.
- To lean the design of eccentrically loaded fillet weld joints and butt welded joints.
- To study the design of brick masonry and axially loaded square and rectangular column and design of retaining wall.
- To learn the design of flitched beam and study about the fundamentals of timber structures.

OUTCOMES

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

- Use working stress method and limit state method
- Design riveted and bolted connections.
- Design masonry structural systems
- Design timber and steel structural joints

UNIT I STRUCTURE AND DESIGN CONCEPTS **9**

Classification of structures – Function, material and shape – Different structural systems – Requirements of structures – Basic structural requirements – Stability, strength and stiffness –Design process – Codes of practice.

Working stress method – Limit state method of design – Probabilistic approach to design – Load and resistance – Design for strength, stiffness and stability considerations – Choice between different structural materials – Concrete, timber, masonry and steel. Structural Loads - Dead load – Live load – Wind load – Calculation of wind load for a structure – Seismic load – Buoyancy and thermal loads

UNIT II DESIGN OF MASONRY WALLS AND COLUMNS **9**

Axially loaded square and rectangular column with uniaxial eccentricity –Solid walls –Load bearing wall –Axially loaded – Eccentrically loaded walls with openings –Non load bearing walls. Laterally loaded masonry structures: Structures and loads – Stability of Masonry structures –Middle third rule –Masonry dams –Trapezoidal dam retaining Walls.

UNIT III LOAD DISTRIBUTION ELEMENTS **9**

Bed blocks – Spread footings for walls and columns –Area based on safe bearing capacity. Design of reinforced Masonry: Principles of Limit state design of reinforced brick masonry –Lintels

UNIT IV TIMBER FLEXURAL AND COMPRESSION MEMBERS **9**

Factors affecting the strength – Permissible stress – design for bending .shear and bearing – Flitched beams –Solid and built-up columns – Combined bending and direct stress –Application to formwork.

UNIT V BOLTED AND WELDED JOINTS **9**

Bearing and friction type of bolts – Splicing joint –Joints subjected to moment and direct load and torsion – Butt and fillet Welds – Joints subjected to shear, bending and torsion.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Timber frame as a structural framing system - methods of construction and manufacturing system. Strengthening of timber and masonry structures

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1 Anand and Arya A.S.Structural Design in Steel, Masonry and timber, Nemchand and Bros.,Roorkee, 2009.
2 Subramanian.N., “Design of steel structures”, Oxford University Press, 2011.

REFERENCES

1 Bhavikatti.S.S, “Design of Steel Structures", IK International publishing house Pvt Ltd., 2009.
2 IS 1907-1987, Code of practice for structural use of unreinforced masonry, BIS, New Delhi.
3 IS 883-1994, Design of structural timber in building – Code of practice, BIS,New Delhi.
4 IS 800-2007, General Construction in steel - Code of practice, BIS,New Delhi.

13C411 HYDRAULIC ENGINEERING LABORATORY 0 0 3 1

OBJECTIVE

- To understand the principles studied in theory by conducting the experiments on Orifice, Notches, Orifice meter and Venturimeter, Losses in Pipes, Pumps and Turbines.

LIST OF EXPERIMENTS

1. Verification of Bernoulli's theorem
2. Determination of co-efficient of discharge for orifice
3. Determination of co-efficient of discharge for notches
4. Determination of co-efficient of discharge for venturimeter
5. Determination of co-efficient of discharge for orifice meter
6. Study of impact of jet on flat plate (normal / inclined)
7. Study of friction losses in pipes
8. Study of minor losses in pipes
9. Study on performance characteristics of Pelton turbine
10. Study on performance characteristics of Francis turbine
11. Study on performance characteristics of Kaplan turbine
12. Study on performance characteristics of Centrifugal pumps (Constant speed /variable speed)
13. Study on performance characteristics of reciprocating pump.
14. Study on performance characteristics of submersible pump.

TOTAL: 45

13C412 SURVEY PRACTICES II 0 0 3 1

OBJECTIVES

- To learn theodolite survey.
- To understand the basic concepts on designing & setting out of simple curve and transition curve
- To learn the working of stereoscope, parallax bar and total station

LIST OF EXPERIMENTS

1. Theodolite survey traverse
2. Heights and distances
   - Single plane method.
   - Double plane method.
3. Tacheometry
   - Tangential system
   - Stadia system
   - Subtense system
4. Setting out of Simple curve (right/left-handed) –(Angular and Linear methods)
5. Setting out of Transition curve
6. Field observation for azimuth
7. Study of stereoscope and Parallax bar
8. Study of Total station.

TOTAL: 45

13C413 COMPUTER AIDED BUILDING DRAWING 0 0 6 2

OBJECTIVES

- To learn building materials symbols, electrical and plumbing symbols. detailing symbols
- To learn the drafting details of doors, windows and staircases
- To understand and draft plan, elevation and section of buildings with load bearing walls, RCC framed buildings and industrial buildings
- To learn drafting procedure of perspective view of one and two storey building.

LIST OF EXPERIMENTS

1. Details of building materials symbols, electrical and plumbing symbols.
2. Details of doors.
3. Details of windows.
4. Details of staircases.
5. Buildings with load bearing walls – Flat roof.
6. Buildings with load bearing walls – Pitched roof.
7. RCC framed structure building.
8. Industrial buildings – Trusses
9. Industrial buildings – North light roof truss.
10. Perspective view of one and two storey buildings.

TOTAL:90

SEMESTER - V

13C501 GEOTECHNICAL ENGINEERING - I 3 1 0 4

OBJECTIVES

- To study the concepts and fundamentals of Soil mechanics.
- To identify and describe the principal properties of soil.
- To study the engineering behavior of soilsuch as permeability, compaction, consolidation and shear strength.
- To study the various techniques for slope stability in soil.

OUTCOMES

At the end of the course the student should be ableto

- Use the different soil classification methods to classify a given soil sample.
- Analyse stresses in soil under various load conditions.
- Analyse the stability of a slope using different analysis methods.

UNIT I INTRODUCTION TO SOIL FORMATION & PROPERTIES – CLASSIFICATION OF SOIL **9**

Soil formation and soil types – Civil engineering problems related to soils – Nature of soil – Simple definitions – Phase relationships – Classification – IS classification system.

UNIT II SOIL WATER AND STRESS DISTRIBUTION **9**

Principles of water flow – Darcy's law – Permeability – Laboratory Methods – Field measurement of permeability – Effective stress concept – Dry and saturated soils. Stress distribution in soil media – Bousinesq's Analysis – Westergaard's Analysis – Intensity of vertical stress using influence charts.

UNIT III CONSOLIDATION AND COMPACTION CHARACTERISTICS OF SOILS **9**

Consolidation – measurement of compressibility – e-log p curves – Terzaghi's one dimensional consolidation theory – Determination of coefficient of consolidation – Dompaction – Factors affecting compaction – Laboratory and field compaction methods.

UNIT IV SHEAR STRENGTH **9**

Shear at a point – Mechanism of shear resistance – Mohr– Coluomb failure criterion – Measurement of shear strength – Direct shear test – Triaxial shear test – Unconfined compression strength test - Vane shear test – Shear strength of clay soil – Shear strength of sand.

UNIT V STABILITY OF SLOPES **9**

Types of slopes – Stability of infinite slope – Stability of Finite slope – Total stress Analysis – Swedish circle method – Use of Taylor's stability number – Slope failure mechanicsm – Effect of Tension cracks.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Reinforced soil slopes and walls – Reinforced soil structures - Slope failure repairs

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. GopalRanjan and Rao, ASR, "Basic and Applied Soil Mechanics" New Age International (P) Limited Publication, New Delhi, Second Edition, 2010.
2. Venkataramaiah, "Geotechnical Engineering", New Age International Ltd., New Delhi Third Edition, 2012.

3. Punmia , B.C, “Soil Mechanics and Foundation Engineering”, Laxmi Publications, New Delhi, Sixteenth Edition, 2005.

REFERENCES

1. Alam Singh, “Modern Geotechnical Engineering”, IBS Publications, New Delhi, 2010.
2. Muni Budhu,”Soil Mechanics and Foundation Engineering”, Wiley India Publication, New Delhi, Second Edition, 2010.

13C502 CONSTRUCTION MANAGEMENT 3 0 0 3

OBJECTIVES

- To understand the basic concepts in construction planning and scheduling
- To study about benefits in project crashing and cost control in a project
- To learn about the importance of safety and quality in construction field
- To study the entire management system

OUTCOMES

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

- Use the basic fundamentals and theory on project planning in construction projects
- Analyze the skill on resource management, quality management and cost management with respect to the project schedule and to implement the mathematical skills to solve the construction problems
- Use the implementation of construction management software and management at organizational level

UNIT I CONSTRUCTION PLANNING **9**

Basic concepts in the development of construction plans–Choice of technology and construction method– Work tasks– Definition– Precedence relationships among activities–Estimating activity durations–Estimating resource requirements for work activities–coding systems

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES **9**

Relevance of construction schedules–Bar charts – The critical path method–Calculations for critical path scheduling–Activity float and schedules–Presenting project schedules–Critical path scheduling for Activity–on–node and with leads, lags and windows– Resource oriented scheduling–Scheduling with resource constraints and precedences –Scheduling with uncertain durations–Crashing and time/cost trade offs –Improving the scheduling process – Introduction to application software

UNIT III COST CONTROL MONITORING AND ACCOUNTING **9**

The cost control problem–The project budget–Forecasting for activity cost control – Financial accounting systems and cost accounts–Control of project cash flows–Schedule control–Schedule and budget updates–Relating cost and schedule information

UNIT IV QUALITY ASSURANCE CONTROL AND MONITORING **9**

Quality and safety concerns in construction–Organizing for quality and safety–Work and material specifications–Total quality control–Quality control by statistical methods –Statistical quality control with sampling by attributes–Statistical quality control by sampling and variables - Codal provisions.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION **9**

Types of project information–Accuracy and use of information–Computerized organization and use of information –Organizing information in databases–Relational model of Data bases–Other conceptual models of databases–Centralized database management systems–Databases and application programs–Information transfer and flow

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Planning and scheduling for an apartment project- Scheduling a residential building using MS project- Preparation of project budget for an office building- Study of primavera

TOTAL: 45

TEXT BOOKS

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw–Hill Publishing Co., New Delhi, 2012.
2. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.

3. S.Seetharaman, “Construction Engineering and Management, Umesh Publishers, New Delhi, 2000.

REFERENCES

1. Halpin,D.W., “Financial and cost concepts for construction Management”, John Wiley and Sons, New York,2005.
2. Jimmie W.Hinze, “Construction Planning and Scheduling”, Prentice Hall Publication,4th edition,2011

13C503 STRUCTURAL ANALYSIS – I 3 1 0 4

OBJECTIVES

- To study the concept of moving loads
- To learn thedifferent types of force and displacement method for analysis

OUTCOMES

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

- Analyse the structure for moving loads.
- Usethe different techniques adopted for analyzing the structures

UNIT I MOVING LOADS AND INFLUENCE LINES 9

Introduction to moving loads - Concept of influence lines - Influence lines for reaction, shear force and bending moment for simply supported beams - Influence lines for forces in trusses – Analysis for different types of moving loads - Single concentrated load - Several concentrated loads - Uniformly distributed load shorter and longer than the span.

UNIT II ARCHES 9

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged and two hinged, parabolic and circular arches – Settlement and temperature effects

UNIT III CONSISTENT DEFORMATION METHOD 9

Introduction – Statically indeterminate beams and pin jointed frames - Maxwell's law of Reciprocal deflection – Generalised Maxwell's theorem-Bettis reciprocal theorem.

UNIT IV SLOPE DEFLECTION METHOD 9

Continuous beams and rigid frames (with and without sway) – Symmetry and antisymmetry – Simplification for hinged end – Support displacements.

UNIT V MOMENT DISTRIBUTION METHOD 9

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway-Box Culvert.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Introduction to Structural Analysis Softwares – STAAD Pro and ETABS

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Vaidyanadhan, R and Perumal, P,"Comprehensive Structural Analysis – Vol. I& Vol. II", , Laxmi Publications, New Delhi, 2010
2. Punmia.B.C, Ashok kumar Jain and ArunkumarJain, "Theory of structures" – II, Laxmi Publication Pvt . Ltd, 2012

REFERENCES

1. Rajasekaran S and Sankarasubramanian G, "Computational Structural Mechanics", Prentice Hall of India Pvt.Ltd, Delhi, 2011
2. Reddy.C.S "Basic Structural Analysis" Tata McGraw- Hill publishing Company Ltd , New Delhi , 2010.
3. William Weaver, Jr& James M.Gere, "Matrix analysis of framed structures", CBS Publishers& Distributors, Delhi, 2004.

4. Pandit G.S. and Gupta S.P., "Structural Analysis – A Matrix Approach", Tata McGraw Hill Publishing Company Ltd., 2010.
5. Bhavikatti.S.S, "Structural Analysis-I",Vikas Publishing House pvtLtd., New Delhi,2011.

13C504 DESIGN OF STEEL STRUCTURES 3 1 0 4

OBJECTIVES

- To study the concept of structures subjected to compressive, tensile and bending loads, as per current codalprovisions including connections.
- To understand the design of structural systems such as roof trusses.
- To learn the analysis and design cold formed steel structures.

OUTCOMES

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

- Solve the problems related to tension and compression members.
- Use the concept of different methods for the design of beams, roof trusses, and industrial structures.
- Analyse all types of industrial structures and cold formed structures
- Design the various steel structures and joints.

UNIT I TENSION MEMBERS **9**

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag.

UNIT II COMPRESSION MEMBERS **9**

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base.

UNIT III BEAMS **9**

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices- Gantry girder.

UNIT IV ROOF TRUSSES AND INDUSTRIAL STRUCTURES **9**

Roof trusses – Roof and side coverings – Design loads, Design of purlin and elements of truss; End bearing.

UNIT V ANALYSIS AND DESIGN OF COLD FORMED STEEL STRUCTURES **9**

Types of cross sections – Concept of local buckling and effective width –Design of compression and tension members – Concept of lateral buckling-Design of beams.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Different types of Roof trusses, Light Gauge Structures, Tall Structures subjected to heavy wind loads - Pre-engineered Buildings

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Dayaratnam, P., “Design of Steel Structures”, Second edition, S. Chand & Company, 2007.
2. Punmia B.C., Ashok Kumar Jain &Arun Kumar Jain, “Comprehensive Design of Steel Structures”, Laxmi Publication, 2013.

REFERENCES

1. Ramachandra, S., “Design of Steel Structures – Vol. I & II”, Standard Publication, New Delhi 2010.
2. Subramanian N, Design of Steel Structures , Oxford University press, USA , 2008.
3. IS 800-2007 General construction in steel – code of practice,BIS,New Delhi.

4. IS 875 -1987 Part I, II, III, IV, V Code of practice for design loads (other than Earth Quake) for buildings and structures, BIS, New Delhi.
5. IS 801- 1975 Code of practice for use of cold formed light gauge steel structural members in general building construction, Dec-1998, BIS, New Delhi.

13C505 ENVIRONMENTAL ENGINEERING - II 3 0 0 3

OBJECTIVES

- To understand the nature of raw wastewater and treatment objectives.
- To understand the sequence of unit operations and unit processes.
- To learn the fundamentals governing the design and performance of the treatment technologies reviewed in the module.
- To study the role of each unit process within typical treatment process trains, their interaction and the context of when they are applied.

OUTCOMES

At the end of the course the student should be ableto

- Plan an effective wastewater treatment plant.
- Design the various primary and secondary treatment units of waste water.
- Solve problems related to sludge disposal and sludge digestion

UNIT I COLLECTION AND CONVEYANCEOF WASTEWATER 12

Quantity and estimation of sanitary sewage-Fluctuations in flow pattern-Storm water runoff estimation-Empirical and rational methods- Design flow for separate andcombined systems-Hydraulics of sewers-Self cleansing velocity- full flow and partial flow conditions, sewer sections and appurtenances, sewer materials, joints, laying, testing, cleaning and maintenance-Types of pumps, house drainage and street connections.

UNIT II CHARACTRISTICS AND ANALYSIS OF WASTEWATER 6

Sources and characteristics of wastewater -Analysis of sewage- Dissolved oxygen- Biochemical oxygen demand-Chemical oxygen demand-Significance and limitations-Relative stability of sewage-Sewage sampling-Effluent disposal standards.

UNIT III PHYSICO CHEMICAL TREATMENT OF WASTEWATER 9

Objectives-Selection of unit operation and process- Design principles of screen chamber, Comminutor, Skimming tanks- Equalization tank-Grit chamber-Primary sedimentation tank-Coagulation and flocculation.

UNIT IV BIOLOGICAL TREATMENT OF WASTEWATER 9

Objectives of biological treatment- Kinetics of biological growth-factors affecting biological growth-Suspended culture systems-Attached culture systems- Activated sludge process and its types-Design of conventional activated sludge process-Oxidation / stabilization ponds-Aerobic and facultative ponds-Lagoons-Trickling Filters-Septic tank and soak pit-design, principle and operation-UASB reactor principles and operation.

UNIT V SLUDGE TREATMENT AND WASTEWATER DISPOSAL TECHNIQUES 9

Sludge characteristics-Weight volume relationship-Sludge conditioning, dewatering, sludge digestion-Process and parameters -Disposal on land- Subsurface irrigation-Sewage sickness of soil-Disposal into water bodies-Self-purification of streams-Oxygen sag curve-Streeter Phelp's model.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Computer Models: Exposure to computer models for water and air quality

TOTAL: 45

TEXT BOOKS

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2010.
2. Peavy S W, Rowe D R and Tchobanoglous G, "Environmental Engineering", Tata McGraw Hill, 2013.

3. Arceivala, S.J. Wastewater treatment for pollution control, Tata McGraw Hill, 2012.
4. Duggal,K.N., “Elements of Environmental Engineering, S.Chand Publishers, New Delhi,2008.

REFERENCES

1. Metcalf and Eddy, M.C., "Wastewater Engineering - Treatment & Reuse", Tata McGraw-Hill Publications, New Delhi, 2003.
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
3. R.L. Droste, Theory and Practice of water and waste water Treatment Wiley India Pvt Ltd, 2011

13C506 TRANSPORTATION ENGINEERING - I 3 0 0 3

OBJECTIVES

- To study the concept of railway planning, geometric design, railway track construction, maintenance and operation of signals, points and crossing, interlocking
- To study the concept of airport planning, design and air traffic control
- To understand the different types of structures used in harbour

OUTCOMES

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

- Design the various geometric elements of railway track, turnout
- Solve the problems related to railway construction and maintenance
- Design and plan the components of airport such as runways, taxiways, terminal building
- Use the techniques for air traffic control
- Design and plan a harbour

UNIT I RAILWAY PLANNING AND DESIGN **9**

Role of Indian Railways in National Development - Engineering Surveys for Track Alignment – Conventional and modern methods - Permanent way, its components and functions of each Component: Rails - Rail fastenings - Concept of gauges, Coning of wheels, Creeps and kinks. Sleepers – Materials, Density. Ballasts – Materials - Ballastless tracks. geometric design of railway tracks – Gradients and grade compensation, Super-Elevation, widening of gauges in curves, Transition curves, Horizontal and vertical curves

UNIT II RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION **9**

Points and crossings - Design of turnouts, Working principle - Signalling, interlocking and track circuiting - Construction & maintenance – Conventional and modern methods - Track drainage - Technologies. Re-laying of Track. Lay outs of railway stations and yards - Rollings stock - Tractive power- Track Resistance - Level Crossings - MRTS

UNIT III AIRPORT PLANNING AND DESIGN **9**

Advantages and Limitations of Air Transport - Airport Planning - Site Selection - Runway Design-Orientation - Cross wind component - Wind rose diagram (Problems) - Corrections for basic runway length - Geometric standards for runway - Taxiway Design – Geometric standards for taxiway - Minimum Separation Clearance - Airport Drainage - Airport Zoning - Clearance over highways and railways

UNIT IV AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL **9**

Airport Layouts – Apron - Terminal Building – Hangars - Motor Vehicle Parking area and circulation Pattern - Airport buildings – Primary functions - Planning concept, Principles of passenger flow, Passenger facilities - Visual aids – Runway and taxiway markings, Wind direction indicators, Runway and taxiway lightings, Air traffic control –Air traffic control network - Helipads

UNIT V HARBOUR ENGINEERING **9**

Harbours - Requirements and classification of harbours, Site selection – Dredging - Planning and Layout of entrance - Terminal facilities – Port buildings - Warehouse - Transit Sheds - Mooring accessories - Navigational aids - Coastal structures- Piers, breakwaters, Wharves, Jetties, Quays, Spring fenders, Dry and wet docks.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Track Modernisation– Automated maintenance and upgrading of railway track, Design of coastal structures – Design of airport pavements-Field visit to railway station, Airport and Harbour

TOTAL: 45

TEXT BOOKS

1. SaxenaSubhash C and SatyapalArora, A Course in Railway Engineering, DhanpatRai and Sons, Delhi, 2010.
2. Khanna S. K., Arora M. G. and Jain S. S., Airport Planning and Design, Nemchand and Brothers, Roorkee, 2006.
3. Bindra S.P., A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 2013.

REFERENCES

1. Rangwala, Railway Engineering, Charotar Publishing House, Pvt Ltd, Anand, 2011.
2. Rangwala, Airport Engineering, Charotar Publishing House, Pvt Ltd, Anand, 2011.
3. Mundrey J.S., “A course in Railway Track Engineering”, Tata McGraw Hill, 2009.

13C511 ENVIRONMENTAL ENGINEERING LABORATORY 0 0 3 1

OBJECTIVES

- To understand the principles of physico chemical analysis of water and wastewater.
- To get a hands on exposure in water and wastewater analysis, to interpret the results and draw conclusions about the quality of water.
- To learn the principles of analysis of common air pollutants.

LIST OF EXPERIMENTS

1. Sampling and preservation methods for analysis of water and wastewater
2. Physical Examination of water: taste, odor and color
3. Determination of pH, acidity and alkalinity
4. Determination of electrical conductivity and TDS
5. Determination of turbidity
6. Determination of hardness
7. Determination of total solids
8. Determination of DO and BOD
9. Determination of COD
10. Determination of fluoride and iron
11. Determination of chloride and sulphate
12. Determination of available chlorine
13. Determination of optimum coagulant dosage
14. Determination of a criteria air pollutant
15. Bacteriological examination of water (Demonstration only)

TOTAL: 45

13J512 COMMUNICATION SKILLS LABORATORY 1 0 3 2

OBJECTIVES

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition? from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions andother recruitment exercises.

Theory **15**

Presentation Skills –Group Discussion-Body Language-Team Work- Time Management-Stress Management –Interview Skills

A. English Language Lab **18**

1. Listening Comprehension:

Listening and typing – Listening and sequencing of sentences – Filling in the blanks -Listening and answering questions.

2. Reading :

Reading Newspapers- Skimming –Scanning -Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. Speaking:

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation

4.Writing

Correction of Errors- Sequencing of Sentences - Letter Writing-Resume-Technical Reports –Minutes of meeting –E mail Communication

B. Viewing and discussing audio-visual materials /Practice Sessions **27**

1. Resume / Report Preparation / Letter Writing

Structuring the resume / Report - Letter writing / Email Communication.

2. Presentation skills: 1

Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language

3. Soft Skills:

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise

4. Group Discussion: 1

GD a part of selection process - Structure of GD – Moderator –Types of GD- Strategies in GD – Team work - Body Language - Mock GD - Technical seminar

5. Interview Skills: 1

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews.

TOTAL: 60

13C513	GEOTECHNICAL ENGINEERING LABORATORY	0	0	3	1

OBJECTIVES

- To learn index properties of soils and soil classification.
- To learn principles of consolidation and shear strength.

LIST OF EXPERIMENTS

1. Moisture content determination.
2. Grain size distribution - Sieve analysis.
3. Specific gravity of soil grains.
4. Relative density of sands.
5. Atterberg limits test.
   a. Liquid limit test
   b. Plastic limit test
   c. Shrinkage limit test
6. Determination of moisture - Density relationship using standard Proctor test.
7. Field density test
   a. Core cutter method
   b. Sand replacement method
8. Permeability determination
   a. Constant head method
   b. Variable head method
9. Direct shear test on cohesion less soil.
10. Unconfined compression test on cohesive soil.
11. Vane Shear Test for Cohesive Soil.
12. California Bearing Ratio test on soil.
13. Triaxial compression test.
14. One dimensional consolidation test.

TOTAL: 45

SEMESTER - VI

13C601 CONCRETE TECHNOLOGY 3 0 0 3

OBJECTIVES

- To understand the properties of concrete,
- To know about the concepts of mix design,
- To acquire knowledge in special concretes, durability of concrete, concreting under special circumstances.

OUTCOMES

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

- Design the given grade of concrete
- Use different special concreting techniques
- Perform test on fresh and hardened concrete

UNIT I CONCRETE MAKING MATERIALS **9**

Cement - Composition and properties of cement - Tests on Physical properties of cement - consistency - setting time - soundness - strength. Other types of cements - composition, properties and uses - BIS specifications. Aggregates: Classification –Characteristics affecting Concrete Properties - Tests on aggregates - BIS specifications. Water : Requirement of water for concrete making – IS code specifications

UNIT II ADMIXTURES AND MIX DESIGN **9**

Admixtures - Plasticizers – super-plasticizers – Retarders – Accelerators – Air entraining admixtures – supplementary cementitious materials: silica fume, fly ash, metakaolin, ground granulated blast furnace slag – water proofing admixtures: Properties, advantages, dosage and application. Mix design: Introduction, concept of mix design – various mix design methods – batching of ingredients: volume batching, weigh batching – IS method and ACI method of mix proportioning- Mix Proportioning of concrete using admixtures.

UNIT III FRESH CONCRETE AND HARDENING OF CONCRETE **9**

Workability: Definition, factor affecting workability, measurement of workability: slump test, K – slump test, compacting factor test – segregation – bleeding – steps of manufacture of concrete: batching, mixing, transporting, placing, compacting – curing of concrete - Factors affecting strength of concrete: water / cement ratio, maturity of concrete, micro – cracking and autogeneous healing – evolution of heat and expansion – shrinkage of concrete and factors affecting it.

UNIT IV DURABILITY OF CONCRETE AND TESTING OF HARDENED CONCRETE **9**

Durability : Definition, significance – permeability – chemical attack, sulphate attack – methods of controlling – thermal properties of concrete – chloride attack – concrete in sea water – resistance to abrasion and cavitations – acoustic properties – corrosion of steel.

Testing on hardened concrete: Compression test, flexural strength of concrete, indirect tension test methods – factors influencing strength results – Accelerated strength tests –determination of modulus of elasticity – in situ strength determination – variation in test results – non destructive strength tests: ultra sonic pulse velocity tests, rebound hammer test.

UNIT V SPECIAL CONCRETES **9**

Lightweight concrete - High strength concrete- High Performance Concrete – Fibre reinforced concrete – Ferrocement – Polymer Concrete- Ready mix concrete – Pumped concrete – Pre-placed concrete – Shotcrete – Vacuum Concrete – Mass Concrete - Sulphur Concrete –Waste material based Concrete. Special Concreting methods – Cold Weather concreting, hot weather concreting

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Recent advancement in concreting methods and their practices – Innovations in special concrete. Eco-friendly materials usage as concrete ingredients -Problems in concreting under special circumstances – Case studies

TOTAL: 45

TEXT BOOKS

1. Shetty M.S., Concrete Technology, S.Chand and Company Ltd., New Delhi,2009.
2. Santhakumar, A.R., Concrete Technology, Oxford University Press, New Delhi, 2009

REFERENCES

1. Neville, A.M., Properties of Concrete, Pearson, 2012.
2. Gambir, M.L. “Concrete Technology”, Tata McGraw Hill, Publishing Co, Ltd, New Delhi, 2004.
3. IS: 10262, “Recommended Guidelines for Concrete Mix Design”, 2009, BIS, New Delhi.

13C602 GEOTECHNICAL ENGINEERING - II 3 1 0 4

OBJECTIVES

- To learn the fundamentals of site exploration.
- To study the concept of earth pressure theories.
- To understand the design of shallow and deep foundations.

OUTCOMES

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

- Solve problems relating to bearing capacity.
- Analyse bearing pressures and load carrying capabilities of different foundation systems.
- Design shallow, deep, and well foundations.

UNIT I SOIL INVESTIGATION AND CHOICE OF FOUNDATION 9

Methods of soil exploration – Boring – Sampling – Disturbed and undisturbed sampling – Sampling techniques – Bore log and soil investigation report – Function and requirements of good foundation –Choice of foundation based on soil conditions.

UNIT II BEARING CAPACITY AND SHALLOW FOUNDATIONS 9

Location and depth of foundations – Codal provisions – Bearing capacity of shallow foundations on homogeneous deposit – Terzaghi's theory – IS code method – Field tests – Factors influencing bearing capacity – Settlement of foundations – Components of settlement – Allowable and maximum differential settlement – Proportioning of footing (no structural design) – Methods of improving bearing capacity – Methods of minimizing settlements.

UNIT III PILE FOUNDATIONS 9

Need for deep foundations -Types of piles - Classification of piles – Load carrying capacity of piles in granular and cohesive soils –Static and dynamic formulae – Pile carrying capacity by field tests - Pile load test – Group capacity – Settlement of pile groups – Negative skin friction.

UNIT IV EARTH PRESSURE AND RETAINING WALLS 9

Earth pressure theory – Plastic equilibrium in soils – Active and passive state – Rankine's theory – Coulomb's wedge theory – Earth pressure on retaining walls of simple configurations – Stability of retaining wall – Culmann's graphical method for determining earth pressure.

UNIT V FOUNDATIONS ON EXPANSIVE SOILS AND GROUND IMPROVEMENT METHODS 9

Shrinkage and expansion of clays – Identification of expansive soils – Measurement of swell and swell pressure – Principles of design of foundations in expansive soils – Ground improvement methods – Preloading – Soil replacement – Densification – Stabilization – Soil reinforcement.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Reinforces soil foundations – Embankments over weak soil - Mechanism of bearing capacity failure in reinforced soils.

TUTORIAL: 15
TOTAL:60

TEXT BOOKS

1. Varghese P.C., “Foundation Engineering”, Prentice Hall of India, 2005.
2. Gopal Ranjan and Rao A.S.R., “Basic and Applied Soil Mechanics”, New age International (P) Ltd Publications, New Delhi, Second Edition, 2010.

REFERENCES

1. Venkataramaiah.C, “Geotechnical Engineering”, New Age International Ltd., New Delhi,2008.
2. Alam Singh., “Modern Geotechnical Engineering”, IBS Publications, New Delhi, 2012.
3. Punmia.B.C., “Soil Mechanics and Foundation Engineering”, Laxmi Publications, New Delhi, Sixteenth Edition, 2005.
4. Braja M. Dass, “Principles of Foundation Engineering”, Thomson Brooks Gole, Singapore, 2005.

13C603 STRUCTURAL ANALYSIS – II 3 1 0 4

OBJECTIVES

- To understand the different types of matrix method of analysis.
- To study the concept of plastic analysis.
- To learn advanced topics such as finite element method and space structures.

OUTCOMES

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

- Analyze the structure by matrix methods for statical and kinematic indeterminancy.
- Analyze space trusses and cable structures.

UNIT I FLEXIBILITY METHOD **9**

Equilibrium and compatibility – Determinate Vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams (with redundancy restricted to two).

UNIT II STIFFNESS METHOD **9**

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames.

UNIT III DIRECT STIFFNESS METHOD **9**

Introduction – Discretisation of a structure – Displacement functions –One and two dimensional elements - Bar element - Truss element – Beam element.

UNIT IV PLASTIC ANALYSIS OF STRUCTURES **9**

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems .

UNIT V SPACE AND CABLE STRUCTURES **9**

Analysis of space trusses using method of tension coefficients – Beams curved in plan - Suspension cables - Cables with two and three hinged stiffening girders.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Fundamental concepts of Finite Element method- Introduction to MATLAB software.

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Vaidyanathan, R. and Perumal, P., “Comprehensive structural Analysis – Vol. I & II”, Laxmi Publications, New Delhi, 2010.
2. Devdas Menon “Advanced Structural Analysis” Narosa publishing House, New Delhi, 2013.

REFERENCES

1. Rajasekeran.S and SankaraSubaramanian.G “Computational structural Mechanics” Prentice hall of India Pvt.Ltd, New Delhi, 2011.
2. Pandit G.S. & S.P. Gupta ,Structural Analysis – A Matrix Approach , Tata McGraw Hill –publishing company Ltd, New Delhi, 2010.
3. Reddy C.S., “Basic Structural Analysis”. Tata McGraw Hill Pub. Ltd., 2010.

13C604 TRANSPORTATION ENGINEERING II 3 0 0 3

OBJECTIVES

- To study the concept of highway planning, alignment, geometric design, pavement design and highway financing
- To understand different materials and equipments for road construction and tunnel construction

OUTCOMES

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

- Use various methods for highway planning, road construction, tunnel construction and highway financing
- Design geometric elements and pavement design
- Analyse the properties of highway materials

UNIT I HIGHWAY PLANNING AND ALIGNMENT **9**

Role of transportation in society- Highway development in India. Institutions for Highway development at National level - Indian Roads Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways, and Central Road Research Institute - Factors controlling highway alignment - Engineering surveys for alignment - Conventional methods and modern methods – Highway financing – Classification and cross section of urban and rural roads - Highway cross sectional elements- Cross sections of different class of roads.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS **9**

Road user - Vehicle and traffic characteristics- Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight distance at intersections, Intermediate sight distance and illumination sight distance - Design of horizontal alignments – Super elevation - Widening of pavements on horizontal curves - Transition curves- Gradients- Summit and valley curves, - Geometric design of hill roads [IRC Standards Only]. Standards for expressways

UNIT III DESIGN OF RIGID AND FLEXIBLE PAVEMENTS **9**

Rigid and Flexible Pavements- Components and their Functions, Design Principles of Flexible and Rigid Pavements, Factors affecting the Design of Pavements. Design Practice for Flexible Pavements [CBR method, IRC Method]. Design Practice for Rigid Pavements – [IRC Recommendations-Problems], Joints

UNIT IV HIGHWAY MATERIALS AND EQUIPMENTS **9**

Desirable properties and testing of highway materials: - Soil – California Bearing Ratio Test, Field density test. Aggregate - Crushing, abrasion, impact tests, water absorption, flakiness and elongation indices and stone polishing value test - Bitumen- Types –Tests on bitumen - Penetration, ductility, viscosity, binder content, softening point, flash and fire point tests.- Bituminous mix design- Road making machinery- Compaction equipment, bituminous construction equipment, cement concrete road making equipments.

UNIT V ROAD CONSTRUCTION AND MAINTENANCE **9**

Construction practice - Water Bound Macadam road - Bituminous road and cement concrete road - Highway drainage - Types of defects in Flexible pavements – Surface defects, cracks, deformation, Disintegration –Symptoms, Causes and Treatments. - Types of failures in rigid pavements –Scaling, shrinkage, warping - Structural cracks, spalling of joints and mud pumping - Special Repairs - Pavement Evaluation – Pavement Surface conditions and structural evaluation - Evaluation of pavement - Failure and strengthening - Overlay design by Benkelman beam method [Procedure only]

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Modern methods for construction and maintenance of roads – Dessert roads – Roads in swampy and waterlogged areas and in black cotton soil – Structures in hill roads

TOTAL: 45

TEXT BOOKS

1. Kadiyali L R, and Lal N.B, Principles and Practice of Highway Engineering, Khanna publishers, Delhi, 2011.
2. Khanna S.K and Justo C E G, Highway Engineering, Nem Chand & Bros, Roorkee, 2001.

REFERENCES

1. Design and specifications of Rural roads (manual) Ministry of rural roads, Government of India, New Delhi 2001.
2. IRC:52- 2001 Recommendations about the Alignment Survey and Geometric Design of Hill Roads, Indian Road Congress, New Delhi
3. Dr..Sharma,S.K. Principles, Practice and Design of Highway Engineering, S.Chand& company New Delhi,2012
4. Guidelines for the design of Flexible Pavements, IRC:37 - 2001, The Indian Roads Congress, New Delhi.
5. Guideline for the design of rigid pavements for highways, IRC: 58-2002, The Indian Roads Congress, New Delhi.

13C605 DESIGN OF RC ELEMENTS 3 1 0 4

OBJECTIVES

- To understand the fundamental principles and procedures of reinforced concrete design.
- To study the principles of reinforced concrete design to real world problems.

OUTCOMES

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

- Apply the basic requirements of the Indian standard IS456-2000 design specification.
- Apply the concepts of strain compatibility and equilibrium concepts to determine the strength of RC members
- Design simple and continuous RC beams of any cross sectional shape for shear, flexure, and deflection.

UNIT I REINFORCED CONCRETE MATERIALS 9

MATERIALS:

Stress strain curve for concrete – Standard concrete mixes for RCC works – Types of reinforcements – Plain and deformed bars – Stress- strain curve for reinforcing steel.

DESIGN CONCEPTS:

Concept of elastic method, ultimate load method and limit state method – Advantages of limit state method over other methods – Design codes and specification – Limit state philosophy as detailed in IS code – Durability limit state – Deflection cracking – Modification factor.

UNIT II DESIGN FOR FLEXURE 9

Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects – Analysis and design of singly and doubly reinforced rectangular and flanged beams

UNIT III DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION 9

Behaviour of RC members in bond and anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.

UNIT IV DESIGN OF COLUMNS AND STAIR CASES 9

Types of columns – Braced and unbraced columns – Design of short column for axial, uniaxial and biaxial bending – Design of long columns- Design of staircases (ordinary and doglegged)

UNIT V DESIGN OF FOOTING AND DETAILING 9

Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Design of combined rectangular footing for two columns only – Standard method of detailing RC beams, slabs and columns – Special requirements of detailing with reference to erection process- Principles of design of mat foundation.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Moment-Curvature relationship for beams - Flexural strengthening of RC beams with composites laminates – Case studies.

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Gambhir,M.L., “Fundamental of Reinforced concrete Design”,PHI learning , Pvt.Ltd.2009
2. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2013

REFERENCES

1. Sinha, S.N. Reinforced Concrete Design – Tata McGraw Hill Publishing Company Ltd. 2008.
2. Unnikrishna Pillai and Devdass Menon - Reinforced Concrete Design – Tata McGraw Hill Publishing Company Ltd. 2008.
3. Purushothaman, P. Reinforced Concrete Structural Elements – Tata McGraw Hill Publishing Co. Ltd. 2007.
4. Punmia .B.C, Ashok kumar jain and Arun kumar jain "Reinforced Concrete Structure", Laxmi publications New Delhi, 2000.
5. Jain, A K, "Limit State Design of RC structures", Nemchand Publications, Roorkee, 2007.
6. SP 16: 1980 Design Aids for Reinforced Concrete to IS 456: 1978, BIS, New Delhi
7. SP 34: 1987 Handbook on Concrete Reinforcement and Detailing, BIS, New Delhi
8. IS 456: 2000 Plain and Reinforced Concrete - Code of Practice, BIS, New Delhi .
9. IS 875 : 1987 Code of practice for design loads (other than earthquake)for buildings and structures, Part 1: Dead loads - Unit weights of building material and stored materials, BIS, New Delhi
   Part 2:Imposed loads,Part 3: Wind Loads,Part 4 Snow loads,Part 5 Special loads and load combinations. , BIS, New Delhi
10. National Building Code 2005, BIS, New Delhi.

13C611 COMPUTER AIDED DESIGN AND DRAFTING LABORATORY 0 0 6 2

OBJECTIVES

- To learn the detailing symbols
- To study the design and drafting procedure of bolted and welded Joints
- To learn the design and drafting procedure of plate Girders, lacing and battening type columns
- To understand the design and drafting procedure of a simple roof truss
- To understand the design and drafting procedure of RCC beams, columns and footings

LIST OF EXPERIMENTS

1. Study of detailing symbols and Standard method of detailing RCC and steel structural members
2. Design and detailing of a bolted Joint subjected to shear and bending
3. Design and detailing of a welded Joint subjected to shear and bending
4. Design and detailing of a simply supported welded Plate Girder
5. Design and detailing of a lacing and battening type columns.
6. Design and detailing of a simple roof truss for gravity loads
7. Design and detailing of a reinforced concrete beam
8. Design and detailing of a reinforced concrete column.
9. Design and detailing of a wall footing
10. Design and detailing of an eccentrically loaded rectangular footing

TOTAL: 90

13C612 CONCRETE AND HIGHWAY LABORATORY 0 0 6 2

OBJECTIVES

- To understand the various tests procedure of fresh and hardened concrete
- To study mix design as per Indian and ACI Standards
- To conduct test on aggregate and bitumen.

LIST OF EXPERIMENTS

TESTS ON CONCRETE

1. Concrete Mix Design – ACI Method and IS Method
2. Workability test on concrete- Slump, Compaction factor and Vee –Bee test
3. Strength test on concrete with and without admixtures – Compressive strength, Split tensile strength test and Flexural strength test
4. Determination of Modulus of elasticity of concrete.
5. Non-Destructive Testing for hardened properties

TESTS ON AGGREGATES

1. Flakiness Index and Elongation Index
2. Crushing Value and Impact Value
3. Abrasion test- Los Angels abrasion test

TESTS ON BITUMEN

1. Penetration test
2. Viscosity test
3. Ductility test
4. Flash and fire point test on bitumen
5. Softening point test on bitumen or tar.
6. Specific gravity test
7. Marshall stability test

TOTAL: 90

SEMESTER - VII

13C701 DESIGN OF REINFORCED CONCRETE STRUCTURES 3 1 0 4

OBJECTIVES

- To study the concept of design of retaining walls
- To learn the design of water retaining structures
- To study the design of staircases, flat slabs concrete walls and principles of design of mat foundation
- To understand the analysis of the slabs using yield line method
- To understand the design of solid slab bridges for IRC loadings and design of Box culverts

OUTCOMES

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

- Design retaining walls, water retaining structures, domes, staging and foundations of elevated water tanks
- Design staircases, flat slabs, concrete walls
- Analyze slabs using yield line method.
- Design solid slab bridges and box culverts for IRC loadings

UNIT I RETAINING WALLS **9**

Design of cantilever and counter fort retaining walls- Design of reinforced concrete walls

UNIT II WATER TANKS **9**

Underground rectangular tanks – Domes – Overhead circular and rectangular tanks – Design of staging and foundations

UNIT III YIELD LINE THEORY **9**

Application of virtual work method to Square, Rectangular, Circular and triangular slabs

UNIT IV PRESTRESSED CONCRETE **9**

Introduction- Pretensioning-Post Tensioning-Loss of prestress- Analysis

UNIT V MISCELLANEOUS TOPICS **9**

Design of flat slabs – Bridges-Introduction-Classification of bridges-IRC loadings- Effective width of load Dispersion-Design of solid slab bridge - Box culverts

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Object oriented program to design a solid slab bridge, Ground level water tanks, Cantilever and counterfort retaining walls

TUTORIAL: 15
TOTAL: 60

TEXT BOOKS

1. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2013.
2. Sinha, N. C. and Roy, S.K., "Fundamentals of Reinforced Concrete", S Chand & Co, Ltd., New Delhi, 2011.

REFERENCES

1. Varghese P C, "Limit State Design of Reinforced Concrete", Prentice Hall of India Ltd, New Delhi, 2008.
2. Gambhir M.L., “Design of Reinforced Concrete Structures”, Prentice Hall of India Ltd, New Delhi, 2008.
3. Syal I C and Goyal A K, "Reinforced Concrete Structures", S.Chand& co., 2008.
4. Ram Chandra, “Limit State Design”, Standard Book House, New Delhi, 2006.
5. Gambhir,M.L ;”Reinforced Concrete Structures”, PHI Learning Private Ltd, NewDelhi 2008.
6. IS 456:2000 “Code of practice for plain and reinforced concrete (fourth revision)”, BIS, New Delhi.
7. IS 3370(Part 1):2009 “Code of practice for concrete structures for the storage of liquids: Part 1 General requirements”, BIS, New Delhi.
8. IS 3370(Part 2):2009 “Code of practice for concrete structures for the storage of liquids: Part 2 Reinforced concrete structures”, BIS, New Delhi.
9. IS 3370(Part 4):1967 “Code of practice for concrete structures for the storage of liquids: Part 4 Design tables”, BIS, New Delhi.
10. IRC:6-2000, Standard Specifications and Code of Practice for Road Bridges, Section II – Loads and Stresses (Fourth Revision), Indian Road Congress, New Delhi.
11. SP 16(S&T): 1980 Design aids for reinforced concrete to IS 456:1978, BIS, New Delhi.
12. SP 34(S&T): 1987 Handbook on concrete reinforcement and detailing, BIS, New Delhi.

13C702 GEOGRAPHICAL INFORMATION SYSTEM 3 0 0 3

OBJECTIVE

- To study about GIS techniques and its application in the field of Civil Engineering

OUTCOME

At the end of the course the student should be able

- Use GIS techniques and apply it in civil engineering field

UNIT I GIS TECHNIQUE AND DATA INPUT **9**

MAP – Types of maps – Development of GIS – Components of GIS – Hardware, software, organization – Types of data – Spatial and non-spatial data – Point, line and polygon – Vector and raster data – Database structures – Files – Vector and raster data structures.

UNIT II DATA ANALYSIS AND MODELLING **9**

Data retrieval – Query – Simple analysis – Spatial analysis – Overlay – Vector data analysis – Raster data analysis –Modelling using GIS – Digital elevation model – Cost and path analysis – Expert systems – Artificial intelligence – Integration with GIS

UNIT III DATA OUTPUT AND ERROR ANALYSIS **9**

Data output – Types – Devices used – Raster and vector display devices – Printers – Plotters – Photo write devices – Sources of errors – Types of errors – Elimination – Accuracies

UNIT IV GIS APPLICATIONS IN RESOURCE MANAGEMENT **9**

Fields of applications – Natural resources – Agriculture – Soil – Water resources – Wasteland management - Social resources - Cadastral records – LIS

UNIT V ADVANCED GIS APPLICATION **9**

AM/FM – Utility network management – Integration with remote sensing – Knowledge based techniques – Multicriteria techniques – Introduction to object oriented data base models.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Fundamental concepts of photogrammetry - Introduction to photogrammetry, Analytical photogrammetry, Digital photogrammetry, Satellite photogrammetry

TOTAL: 45

TEXT BOOKS

1. Burrough P A, Principles of GIS for Land Resources Assessment, Oxford Publication, 2000.
2. Michael N Demers, Fundamentals of Geographical Information Systems, Third Edition, John Wiley Publications, 2008.

REFERENCE

1. Paul A Longley, Michael F Good child ,Geographical Information Systems Volume I and II, Second Edition, John Wiley Publications, 2010.

13C703 SEISMIC DESIGN OF STRUCTURES 4 0 0 4

OBJECTIVES

- To understand the theory of vibration and basics of structural dynamics.
- To study the design philosophy of earthquake resistant design of structures.
- To learn the codal provisions for aseismic design of structures.

OUTCOMES

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

- Analyze a structure by seismic coefficient method.
- Analyse structural integrity of a structure.
- Design framed structures for Earthquake Resistant Design

UNIT I THEORY OF VIBRATIONS 12

Concept of inertia and damping – Types of Damping – Difference between static forces and dynamic excitation – Degrees of freedom – SDOF idealisation – Equations of motion of SDOF system for mass as well as base excitation – Free vibration of SDOF system – Response to harmonic excitation – Impulse and response to unit impulse – Duhamel integral

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM 12

Two degree of freedom system – Normal modes of vibration – Natural frequencies - Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Mode superposition Method (Concepts only)

UNIT III ELEMENTS OF SEISMOLOGY 12

Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound – Epicentre – Hypocentre – Primary, shear and Rayleigh waves – Seismogram – Magnitude and intensity of earthquakes – Magnitude and intensity scales – Spectral acceleration - Information on some disastrous earthquakes

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE 12

Response and design spectra – concept of peak acceleration –Effect of soil properties and damping – Liquefaction of soils – Importance of ductility – Methods of introducing ductility into RC structures.

UNIT V DESIGN METHODOLOGY 12

Seismic Design concepts-Design Spectrum – Earthquake Resistant Design of simple framed structures- IS 1893, IS 4326- Codal provisions- ductile detailing of reinforced concrete frames as per IS 13920- Base isolation techniques – Vibration control measures.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Computer aided analysis and design of building systems for earthquake loads-Responsespectrum and time history methods

TOTAL: 60

TEXT BOOKS

1. Pankaj Agarwal and Shrikhande, Earth quake resistant Design of Structures, PHI Learning ,2009.
2. Chopra, A.K., “Dynamics of Structures – Theory and Applications to Earthquake Engineering”, Second Edition, Pearson Education, 2007.
3. Damodarasamy,S.R.,Kavitha,S. “Basics of Structural Dynamics and Aseismic Design”, PHI Publishers, New Delhi.

REFERENCES

1. Dowrick, D.J., “Earthquake Resistant Design & Risk Reduction”, John Wiley & Sons, London , 2009.
2. Paz, M., “Structural Dynamics – Theory & Computation”, CBS Publishers & Distributors, Shahdara, Delhi, 2010.
3. IS 1893-2002, Criteria for Earth Quake resistant design of structures part – I,BIS,New Delhi.
4. IS 13920-1993, Ductile Detailing of Reinforced Concrete Structures subjected to seismic force – Code of practice, BIS, New Delhi.
5. IS 4326-1993, Earth Quake resistant design &construction of building - Code of practice, BIS, New Delhi.

13C704 IRRIGATION ENGINEERING 3 0 0 3

OBJECTIVES

- To understand the need and mode of irrigation.
- To study about minimizing water losses and on farm development works.
- To learn the concepts involved in elementary hydraulic design of different structures and its maintenance.

OUTCOMES

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

- Plan irrigation projects.
- Design of hydraulic structures

UNIT I INTRODUCTION **9**

Irrigation – Need and mode of irrigation – Advantages and types of irrigation – Crop and crop seasons – consumptive use of water – Root zone depth – Duty and delta –Relationship – Factors affecting duty – Irrigation efficiencies – Planning and development of irrigation projects.

UNIT II IRRIGATION METHODS **9**

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits –Sprinkler irrigation – Drip irrigation.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES **9**

Functions of diversion head works – Types – Weirs – Causes of failure of weirs and their remedies – Weirs on pervious foundations - Types of impounding structures - Tanks, sluices and weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams

UNIT IV CANAL IRRIGATION **9**

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal head works – Canal regulators – River training works.

UNIT V IRRIGATION WATER MANAGEMENT **9**

Need for optimization of water use – Minimizing irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

UNIT VI STATE OF ART/ADVANCES (NOT FOR EXAMINATION)

Modeling of irrigation systems using ANN - Improving the energy efficiency of the pumping system - irrigation scheduling techniques to make the application of the right amount of water possible, avoiding excess applications

TOTAL: 45

TEXT BOOKS

1. Santhosh Kumar Garg, "Irrigation and Hydraulic Structures", Khanna Publishers, New Delhi, 2011.
2. Punmia BC and Pande B B Lal, “Irrigation and Water Power Engineering”, Laxmi Publications Pvt Ltd., New Delhi, 2009.

REFERENCES

1. Sahasra Budhe S R, "Irrigation and Hydraulic Structures", Katson Publishing House, Ludhiana, 1996.
2. Asawa G L,"Irrigation Engineering", New Age International Publishers, New Delhi 2009

13C711	ESTIMATION AND COSTING	0	0	6	2

OBJECTIVES

- To study computer aided estimation and costing of various structural elements
- To understand the different types of buildings and its valuation

LIST OF EXPERIMENTS

1. Specification.
2. Estimation of load bearing walls.
3. Estimation of R.C.C framed structures.
4. Estimation of septic tanks and soak pit.
5. Estimation of water supply systems.
6. Estimation of sewerage systems.
7. Estimation of roads.
8. Estimation of retaining walls.
9. Estimation of culverts.
10. Costing analysis of residential building.
11. Costing analysis of industrial building.
12. Estimation using softwares (Primavera, MS Project)

TOTAL:90

13C721	COMPREHENSIVE VIVA-VOCE	0	0	0	1

OBJECTIVE

At the end of the course the student should be able

- To refresh all the departmental courses studied in the earlier semesters

13C751	**PROJECT WORK - PHASE I**	**0**	**0**	**3**	**1**

OBJECTIVES

- To impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc.
- At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

SEMESTER - VIII

13C851	**PROJECT WORK-PHASE II**	**0**	**0**	**18**	**6**

OBJECTIVES

At the end of the course the student should be able

- To enable the students to gain working knowledge in theoretical and experimental studies related to the branch of study.
- To expand his / her knowledge base and also provide opportunity to utilize the creative ability and inference capability.
- Every project work shall have a guide who is the member of the faculty of the institution. Eighteen periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present periodical seminars on the progress made in the project.
- To produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines by the department.

TOTAL: 270