

# **B.TECH CIVIL ENGINEERING**

## **SYLLABUS**

(with effect from June 2015)



**DEPARTMENT OF RURAL TECHNOLOGY CENTRE**  
The Gandhigram Rural Institute – Deemed University  
Gandhigram – 624 302 Tamil Nadu

**RURAL TECHNOLOGY CENTRE**  
**B.TECH CIVIL ENGINEERING**  
**CURRICULAM 2015-2016**

<b>SEMESTER I</b>									
<b>S. N O</b>	<b>Course Code</b>	<b>Course Title</b>	<b>C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CFA</b>	<b>ESE</b>	<b>Total</b>
<b>THEORY</b>									
1	15ENGU01X1	English I	3	3	0	0	40	60	100
2	15MATU01C1	Engineering Mathematics I	3	3	0	0	40	60	100
3	15PHYU01C1	Engineering Physics	3	3	0	0	40	60	100
4	15CHEU01C1	Engineering Chemistry	3	3	0	0	40	60	100
5	15BCEU0101	Construction Materials	3	3	0	0	40	60	100
<b>PRACTICALS/EXTENSION</b>									
6	15BCEU0102	Engineering Graphics	2	1	0	2	60	40	100
7	15PHYU01C2	Engineering Physics Laboratory	2	0	0	3	60	40	100
8	15CHEU01C2	Engineering Chemistry Laboratory	2	0	0	3	60	40	100
9	15BCEU0103	Basic Workshop	2	0	0	3	60	40	100
10	15YOGU0001	Yoga	1	1	0	0	50	-	50
<b>Total</b>			<b>24</b>	<b>17</b>	<b>0</b>	<b>11</b>			

<b>SEMESTER II</b>									
<b>S. N O</b>	<b>Course Code</b>	<b>Course Title</b>	<b>C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CFA</b>	<b>ESE</b>	<b>Total</b>
<b>THEORY</b>									
1	15ENGU02X2	English II	3	3	0	0	40	60	100
2	15MATU02C2	Engineering Mathematics II	3	3	0	0	40	60	100
3	15BCEU0204	Construction Techniques and Equipments	3	3	0	0	40	60	100
4	15BCEU0205	Basic Electrical and Electronics Engineering	3	3	0	0	40	60	100
5	15BCEU0206	Energy & Environmental Science	3	3	0	0	40	60	100
6	15BCEU0207	Engineering Mechanics	3	3	0	0	40	60	100
<b>PRACTICALS/EXTENSION</b>									
7	15CSAU02C1	Introduction to Computers and Programming in C	3+1	3	0	2	24+24	36+16	100
8	15BCEU0208	Construction Practice Laboratory	2	0	0	3	60	40	100
9	15BCEU0209	Computer Aided Drawing	2	0	0	3	60	40	100
10	15NSSU0001/ 15SHSU0001/ 15FATU0001/ 15SPOU0001	NSS/Shanti Sena/Fine Arts/Sports and Games	1	0	0	0	50	-	50
<b>Total</b>			<b>27</b>	<b>21</b>	<b>0</b>	<b>8</b>			

SEMESTER III									
S. N O	Course Code	Course Title	C	L	T	P	CFA	ESE	Tot al
<b>THEORY</b>									
1	15MATU03C3	Engineering Mathematics III	3	3	0	0	40	60	100
2	15BCEU0310	Mechanics of Solids I	3	3	0	0	40	60	100
3	15BCEU0311	Mechanics of Fluids I	3	3	0	0	40	60	100
4	15GEOU03C1	Applied Geology	3	3	0	0	40	60	100
5	15BCEU0312	Surveying I	3	3	0	0	40	60	100
6	15BCEU0313	Concrete Technology	3	3	0	0	40	60	100
7	15SOCU03A1	Socio Economic Structure and Sustainable Development	2	2	0	0	40	60	100
8	15GTPU0001	Gandhi's life, thought and work	2	2	0	0	20	30	50
<b>PRACTICALS/EXTENSION</b>									
9	15BCEU0314	Survey Practical I	2	0	0	3	60	40	100
10	15BCEU0315	Strength of Materials Laboratory	2	0	0	3	60	40	100
11	15EXNU03V1	Village Placement Programme	2	0	0	0	50	-	50
<b>Total</b>			<b>28</b>	<b>22</b>	<b>0</b>	<b>6</b>			

SEMESTER IV									
S. N O	Course Code	Course Title	C	L	T	P	CFA	ESE	Tot al
<b>THEORY</b>									
1	15MATU04C4	Numerical Methods	3	3	0	0	40	60	100
2	15BCEU0416	Mechanics of Solids II	3	3	0	0	40	60	100
3	15BCEU0417	Mechanics of Fluids II	3	3	0	0	40	60	100
4	15BCEU0418	Surveying II	3	3	0	0	40	60	100
5	15BCEU0419	Soil Mechanics	3	3	0	0	40	60	100
6	15BCEU0420	Highway Engineering	3	3	0	0	40	60	100
<b>PRACTICALS/EXTENSION</b>									
7	15BCEU0421	Soil Mechanics Laboratory	2	0	0	3	60	40	100
8	15BCEU0422	Survey Practical II & Survey Camp*	2	0	0	3	60	40	100
9	15BCEU0423	Fluid Mechanics Laboratory	2	0	0	3	60	40	100
10	15BCEU0424	Summer Internship	2	0	0	0	100	-	100
<b>Total</b>			<b>26</b>	<b>18</b>	<b>0</b>	<b>9</b>			

\*10 days for Survey camp

SEMESTER V									
S. N O	Course Code	Course Title	C	L	T	P	CFA	ESE	Tot al
<b>THEORY</b>									
1	15APRU0001	Elements of Research Methods	3	3	0	0	40	60	100
2	15BCEU0525	Foundation Engineering	3	3	0	0	40	60	100
3	15BCEU0526	Structural Analysis	3	3	0	0	40	60	100
4	15BCEU0527	Design of RCC Elements	3	3	0	0	40	60	100
5	15BCEU0528	Railways& Airport Engineering	3	3	0	0	40	60	100
6	15BCEU0529	Water Supply Engineering	3	3	0	0	40	60	100
7	15BCEU0530	Construction Management	3	3	0	0	40	60	100
<b>PRACTICALS/EXTENSION</b>									
8	15BCEU0531	Estimation, Costing and Valuation	2	1	0	2	60	40	100
9	15BCEU0532	Concrete and Highway Engineering Laboratory	2	0	0	3	60	40	100
<b>Total</b>			<b>25</b>	<b>22</b>	<b>0</b>	<b>5</b>			

SEMESTER VI									
S. N O	Course Code	Course Title	C	L	T	P	CFA	ESE	Tot al
<b>THEORY</b>									
1	15BCEU0633	Design of Reinforced Concrete & Brick Masonry Structures	3	3	1	0	40	60	100
2	15BCEU0634	Water Resource & Irrigation Engineering	3	3	0	0	40	60	100
3	15BCEU0635	Advanced Structural Analysis	3	3	1	0	40	60	100
4	15BCEU0636	Design of Steel Structures	3	3	0	0	40	60	100
5	15BCEU0637	Waste Water Engineering	3	3	0	0	40	60	100
6		Non Major Elective*	3	3	0	0	40	60	100
<b>PRACTICALS/EXTENSION</b>									
7	15CHEU06C3	Environmental Engineering Laboratory	2	0	0	3	60	40	100
8	15BCEU0638	Irrigation & Environmental Engineering Drawing	2	1	0	2	60	40	100
9	15BCEU0639	Design Project	3	0	0	3	60	40	100
10	15BCEU0640	Summer Internship	2	0	0	0	100	-	100
<b>Total</b>			<b>27</b>	<b>19</b>	<b>2</b>	<b>8</b>			

\*Offered by other Departments of GRI

SEMESTER VII									
S. N O	Course Code	Course Title	C	L	T	P	CFA	ESE	Total
<b>THEORY</b>									
1	15BCEU0741	Pre-stressed Concrete Structures	3	3	0	0	40	60	100
2	15BCEU0742	Solid Waste Management	3	3	0	0	40	60	100
3	15BCEU0743	Fundamentals of RS & GIS	3	2	0	2	40	60	100
4	15BCEU0744	Basics of Dynamics and Aseismic Design	3	3	0	0	40	60	100
5	15BCEU07EX	Major Elective I	3	3	0	0	40	60	100
6	15BCEU07MX	Modular course I	2	0	0	0	50	0	50
<b>PRACTICALS/EXTENSION</b>									
7	15BCEU0745	Technical Seminar	2	0	0	3	100	-	100
8	15BCEU0746	Computer Aided Design and Drafting Laboratory	2	1	0	2	60	40	100
<b>Total</b>			<b>21</b>	<b>15</b>	<b>0</b>	<b>7</b>			

SEMESTER VIII									
S. N O	Course Code	Course Title	C	L	T	P	CFA	ESE	Total
<b>THEORY</b>									
1	15BCEU0847	Cost Effective Construction Technology	3	2	0	2	40	60	100
2	15BCEU08EX	Major Elective II	3	3	0	0	40	60	100
3	15BCEU08MX	Modular course II	2	0	0	0	50	0	50
<b>PRACTICALS/EXTENSION</b>									
4	15BCEU0848	Project	6	0	0	12	75	125	200
<b>Total</b>			<b>14</b>	<b>5</b>	<b>0</b>	<b>14</b>			

Total	
<b>C</b>	<b>192</b>
<b>L</b>	<b>139</b>
<b>T</b>	<b>02</b>
<b>P</b>	<b>68</b>

**C - Credit, L – Lecture, T – Tutorial, P – Practical,**

**CFA – Cumulative Formative Assessment, ESE – End Semester Examination**

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<b>MAJOR ELECTIVE I</b> <b>(any one of the subject is to be selected)</b> <b>15BCEU07EX</b>		
1	15BCEU07E1	Hydrology
2	15BCEU07E2	Traffic Engineering and Management
3	15BCEU07E3	Earthquake Engineering
4	15BCEU07E4	Advanced Storage Structures
5	15BCEU07E5	Finite Element Techniques
<b>MAJOR ELECTIVE II</b> <b>(any one of the subject is to be selected)</b> <b>15BCEU08EX</b>		
1	15BCEU08E1	Repair & Rehabilitation of Structures
2	15BCEU08E2	Smart Structures and Smart Materials
3	15BCEU08E3	Bridge Engineering
4	15BCEU08E4	Ground Water Hydrology
5	15BCEU08E5	Water Resources Systems Analysis

<b>MODULAR COURSE I</b> <b>(For B.Tech Civil Engineering Programme - self study mode)</b> <b>15BCEU07MX</b>		
1	15BCEU07M1	Disaster Management
2	15BCEU07M2	Air Pollution Management
3	15BCEU07M3	Environmental Impact Assessment
4	15BCEU07M4	Architecture
<b>MODULAR COURSE II</b> <b>(For B.Tech Civil Engineering Programme - self study mode)</b> <b>15BCEU08MX</b>		
1	15BCEU08M1	Town and Country Planning
2	15BCEU08M2	Ground Improvement Techniques
3	15BCEU08M3	Building Services
4	15BCEU08M4	Contract Laws and Regulations

**SEMESTER I**  
**15MATU01C1 ENGINEERING MATHEMATICS I**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

**Objectives:**

- To apply advanced matrix knowledge to Engineering problems.
- To equip themselves familiar with the functions of several variables.
- To familiarize with the applications of differential equations.
- To improve their ability in solving geometrical applications of differential calculus problems
- To expose to the concept of three dimensional analytical geometry.

**UNIT I        MATRICES**

Characteristic equation – Eigen values and Eigen vectors of a real matrix. Some properties of Eigen values, Cayley-Hamilton theorem, orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformation.

**UNIT II        THREE DIMENSIONAL ANALYTICAL GEOMETRY**

Direction cosines and ratios – Angle between two lines – Equation of a plane – Equation of a straight line – Co-planer lines – Shortest distance between skew lines – Sphere – Tangent plane – Plan e section of a sphere – orthogonal spheres.

**UNIT III       GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS**

Curvature – Cartesian and polar coordinates – Circle of curvature – Involute and Evolute – Envelopes – properties of envelopes – Evolute as envelope of normal.

**UNIT IV       FUNCTIONS OF SEVERAL VARIABLES**

Functions of two variables – Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima – Constrained Maxima and Minima by Lagrangean Multiplier method – Jacobians – differential under integral sign.

**UNIT V        ORDINARY DIFFERENTIAL EQUATIONS**

Simultaneous first order linear equations with constant coefficients – Linear equations of second order with constant and variable coefficients – Homogeneous equation of Euler type – equations reducible to homogeneous form – Method of reduction of order – Method of variation of parameters.

**TEXT BOOKS:**

1. Kreyszig. E., "Advanced Engineering Mathematics "(8<sup>th</sup> Edition), John Wiley and Sons (Asia) Pte. Ltd., Singapore, 2001
2. Veerarajan. T. "Engineering Mathematics", Tata McGraw Hill Publishing Co., New Delhi, 1999.

**REFERENCES:**

1. Grewal, B.S., "Higher Engineering Mathematics", (35<sup>th</sup> Edition), Khanna Publishers, Delhi, 2000
2. Kandasamy. P, Thilagavathy, K., and Gunavathy. K., "Engineering Mathematics", Volume I (4<sup>th</sup> Revised Edition) S.Chand & Co., New Delh, 2000
3. Narayanan, S., Manicavachagom Pillay, T.K.Ramanaiah. G., "Advanced Mathematics for Engineering Students". Volume I (2<sup>nd</sup> Edition), S.Viswanathan (Printers & Publishers), 1992.
4. Venkataraman, M.K., "Engineering Mathematics – First year "National Publishing Company, Chennai (2<sup>nd</sup> Edition), 2000

## **15PHYU01C1 ENGINEERING PHYSICS**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

- To understand the general scientific concepts required for technology
- To apply the Physics concepts in solving engineering problems
- To educate scientifically the new developments in engineering and technology.

### **UNIT I      ACOUSTICS AND ULTRASONICS**

Classification of sound - Characteristics of musical sound - Units of loudness - decibel and phne - Intensity of sound - Acoustic pressure - Acoustics of buildings - Reverberation time - Sabine's formula - Absorption coefficient - Sound absorbing materials - Sound insulation in machines - Ultrasonic - Production, properties and applications.

### **UNIT II      OPTICS AND LASERS**

Principle of interference - Coherent sources - Young's double slit experiment - Expression for band width - Fresnel's biprism - Fresnel and Fraunhofer diffraction - Plane diffraction grating - Theory and determination of wavelengths - Polarization - Double refraction - Nicol prism - Production and analysis of different polarized lights - Optical activity - Polarimeter - Principle and characteristics of laser - Ruby laser - He-Ne laser - Applications of lasers.

### **UNIT III      MODERN PHYSICS**

Quantum Nature of energy - Dual nature of matter - Einstein's mass-energy relation - Nuclear fission - Controlled chain reaction - Nuclear power reactor - Nuclear fusion - Crystalline and non-crystalline solids - Unit cell and Bravais lattices - Miller indices - Packing factor of SC, BCC and FCC.

### **UNIT IV      NON-DESTRUCTIVE TESTING**

Different steps involved in non-destructive testing - Principle of X-ray radiographic technique - Comparison between X-ray radiography and gamma ray radiography - Liquid penetrant method - Ultrasonic method - Magnetic and electrical methods.

### **UNIT V      SEMICONDUCTOR**

Understanding Semi-conductor – materials – Electronic Devices – Micro electronics & LSI - Introduction to Nanotechnology – Emerging materials and energy lighting and communication.

### **REFERENCE BOOKS:**

**9**

1. Arumugam, M. Engineering physics, Anuradha publishers, 1998.
2. Srinivasan, M.R. Physics for Engineers, New Age International (P) Ltd., 1998.
3. Kin sleer, L.E. and Frey, A.R., Fundamentals of Acoustics, Wiley Eastern Ltd., 1996.
4. Woodcock, J.P. Ultrasonics, Adam Hilger Ltd., 1979.
5. Masilamani, V and Azzeer, A.M., Laser the light Extraordinary, Anuradha Agencies, 1999.
6. Halliday, Resnick and Krane, Physics Vol.II, John Wiley and Sons (P) Ltd., 1994.
7. Gonnagle, W.U., Nondestructive testing methods, McGraw Hill Book Co., 1961.

## 15CHEU01C1 ENGINEERING CHEMISTRY

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### Objectives:

The objective of the course is to emphasize the importance of water and its treatment methods for industrial applications, to give an overview of various types of fuels including their refining methods, to stress the importance of corrosion of metals and methods needed to protect the metallic materials, to make the students understand the need of high polymers and other engineering materials.

### Specific objective of learning outcomes:

Upon completion of the course, the students will be able to

- Describe the water treatment methods for industrial applications
- Categorize various types and sources of fuels
- Demonstrate the methods to prevent corrosion of metallic materials
- Describe the importance of high polymers and engineering materials

## UNIT I WATER TECHNOLOGY

Sources and impurities-hardness of water-expression and estimation by EDTA-Treatment of water for boilers-internal treatment-colloidal, Phosphate, calgon and carbonate conditioning of water-external treatment-lime-soda, Zeolite and deionization processes-treatment of water for domestic purposes-sedimentation-coagulation, filtration, disinfection-sterilization, chlorination, break-point chlorination, ozonisation-reverse osmosis-desalination. Water pollution-Sources-elementary idea of primary and secondary treatment -Significance of BOD and COD.

## UNIT II ENERGY SOURCES

Fuels-Classification of fuels-gross and net calorific values-proximate and ultimate analysis of coal-manufacture of coke by Otto-Haffman method-refining of petroleum-synthetic petrol-Bergius process-Knocking-octane number-diesel knocking-cetane number-gaseous fuels-water gas, producer gas, biogas and coal gas, hydrogen as a fuel.

### NanoChemistry

Introduction-carbon nano tubes-application in fuel cells-nanotechnology in paints.

## UNIT III CORROSION AND ITS PREVENTION

Corrosion-types of corrosion-theories of corrosion and mechanism of wet corrosion hydrogen evolution type oxygen absorption type-pilling-Bed worth rule-Dry corrosion-Galvanic corrosion-Galvanic series-concentration-cell corrosion-control of corrosion-sacrificial anode and impressed current, cathodic protection-corrosion inhibitors-vapour phase inhibitor.

### Protective Coatings

Metallic coatings types-application-hot dipping galvanizing and tinning-electroplating-surface conversion coatings-organic-coating-paints constituents-varnishes, Lacquers-uses-special paints-heat resistant, fire retardant and luminous paints.

## **UNIT IV      HIGH POLYMERS**

Polymers-Addition and condensation-Plastics-thermoplastic and thermosetting plastics-preparation properties and uses of following: LDPE, HDPE, PVC, Teflon and nylon-rubber-processing of natural rubber-vulcanization-elastomers-Buna-S, Buna-N, thiocol and polyurethane.

### **Adhesives**

Adhesive action-factors influencing adhesive action-physical and chemical-classification.

## **UNIT V      ENGINEERING MATERIALS**

Cement-Manufacture of portland cement-Chemical composition of portland cement-setting and hardening of cement-Special cement-Aluminous cement, White portland cement, Sorel cement, Water proof cement.

### **Abrasives**

Abrasives-natural and artificial-refractories-classification-insulating refractories-glass-ceramics-clay.

### **Lubricants**

Mechanism of lubrication-classification-Lubricating oils-Greases, solid lubricants.

## **REFERENCES:**

1. P. C. Jain; Monika Jain, Engineering Chemistry, 15<sup>th</sup> edition, Dhanpat Raj Publishing Company, Delhi, 2008.
2. M. R. Balasubramaniam, S. Krishnamoorthy, V. Murugesan, Engineering Chemistry, Allied Publisher Limited., Chennai, 1993.

## **15BCEU0101 CONSTRUCTION MATERIALS**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **OBJECTIVES:**

- To learn the manufacturing process, types, applications and testing procedures for materials used for load bearing purpose
- To know about materials that is used for protection and functional purpose.
- To impart knowledge about basis of recent paradigms, and new materials

### **UNIT I STONES**

Classification - Selection - Application of stone in buildings - Requirement and testing of stones - Deterioration and preservation of stone work - Artificial stones.

### **UNIT II BRICKS AND BUILDING BLOCKS**

Manufacture of bricks - classification - Qualities - Test on Bricks - Fire bricks - building blocks types and uses - joist and filter blocks - Curved shell units - Lightweight concrete blocks.

### **UNIT III MORTAR, CEMENT AND CONCRETE**

Classification of mortar - Preparation - Selection of mortar - Tests for mortars - Manufacture of cement - Types of cement - Characteristics - Aggregates - Basic Characteristics - Types of aggregates - Admixtures - Properties of fresh concrete - Properties of hardened concrete - Slump Test - Vebe test - Flow test - Compacting factor test - Types of Concrete.

### **UNIT IV MATERIALS FOR BUILDINGS SERVICES**

Timber - Market forms - Industrial timber - Plywood Veneer - Thermocole - Panels of laminates - Steel - Composition - uses - Market forms - Mechanical treatment - Paints - Vanishes - Distempers.

### **UNIT V SPECIAL MATERIALS**

Glass - Ceramics - Sealants for joints - Sheets for pitched roof coverings - Fibre glass reinforced plastic - Clay products - Refractories - Composite materials - Types - Applications of laminar composites - Fibre textiles - mats and pads for earth reinforcement - Recycling of Industrial waste as building material - Polymers in Civil Engineering.

### **TEXT BOOKS:**

1. Bindra and Arora, “ Building Materials and construction”. Dhanpat Rai and Sons, New Delhi 1994
2. Punmia B.C. “Building Materials and Construction”, Laxmi Publications Pvt. Ltd, 1997

### **REFERENCE BOOKS:**

1. Rangwala S.C. “Engineering Materials”, Charotar Publishing House, Anand, India, 1997
2. Surendra Singh, “Building Materials”, Vikas Publishing Company, New Delhi, 1996.
3. Brain Culshaw, “Smart structure and Materials”, Artech House, Borton, London, 1996
4. Deodhar S. V. “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi 2001 National Building Code of India, 1983
5. IS 1003 (Part I): Timber, Panelled and Glazed shutters – Specifications, 1991
6. IS 4021: Timber Doors, Windows and Ventilator Frames – Specifications, 199

## 15BCEU0102 ENGINEERING GRAPHICS

C: 2, L: 1, T: 0, P: 2, CFA: 60, ESE: 40

### OBJECTIVES:

To make student conversant

- With the construction of geometrical figures
- With the projection of 1D, 2D and 3D elements
- With the sectioning of solids and development of surfaces
- With the Preparation and interpretation of building drawing

### Specific Objectives of Learning:

- On completion of the course, the students will be able to understand the drawing, projection of lines, points and solids, understand the intersection of solids and able to draw the any type of technical drawing with detailed specification in scaling system.

### UNIT I PLANE CURVES AND FREE HAND SKETCHING

**Curves used in engineering practices:** Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above curves.

**Free hand sketching:** Representation of Three Dimensional objects – Need for and importance of multiple views and their placement – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

### UNIT II PROJECTION OF POINTS, LINES

General principles of orthographic projection – First angle projection – Layout of views – Projection of points, located in all quadrant and straight lines located in the first quadrant – Determination of true lengths and true inclinations and location of traces

### UNIT III PROJECTION OF SOLIDS

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method and change of reference plane (Auxiliary projection method) method.

### UNIT IV INTERSECTION OF SOLIDS

Development of lateral surfaces of two Intersecting solids – prism & cylinder, cylinder & cylinder – Axis at right angles with no offset.

### UNIT V BUILDING DRAWING

Buildings with load bearing walls (Flat and pitched roof) – Including details of doors and windows RCC framed structures

### TEXT BOOKS:

1. K.V. Natarajan “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2006.
2. M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education, 2005.

### REFERENCES:

1. N.D. Bhatt “Engineering Drawing” Charotar publishing House 46<sup>th</sup> Edition, 2003.
2. K.R. Gopalakrishnana. “Engineering Drawing” (Vol. I & II) Subhas Publications – 1998.
3. Luzadder and Duff, “Fundamentals of Engineering Drawing” Prentice Hall of India Pvt Ltd, XI Edition - 2001.
4. K.Venugopal “Engineering Graphics”, New Age International (P) Limited, 2002.

## 15PHYU01C2 ENGINEERING PHYSICS LAB

C: 2, L: 0, T: 0, P: 3, CFA : 60, ESE : 40

### Objectives:

To develop scientific temper in experimental techniques and to reinforce the physics concepts among the engineering students.

### List of Exercises

1. Young's modulus by non linear bending
  2. Rigidity modulus and moment of inertia using Torsion Pendulum
  3. Viscosity of a liquid by Poiseuille's method
  4. Wavelength determination using grating spectrometer
  5. Characteristics of semiconductor
  6. Thermal conductivity by Lees Disc
  7. Thickness of wire by Air Wedge
  8. Thermo emf measurement by potentiometer
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## 15CHEU01C2 ENGINEERING CHEMISTRY LABORATORY

C: 2, L: 0, T: 0, P: 3, CFA : 60, ESE : 40

**Objectives:** The objective of the practical course is to enhance knowledge in basic principles of titrimetry, to develop skill in titrimetric analysis, to gain practical knowledge in oil analysis and to develop skill in identification of water quality parameters.

**Specific objective of learning outcomes:** After successful completion of the course, students will be able to

- Prepare standard solutions
- Estimate hardness and alkalinity of water
- Estimate iron, sodium in water by spectrophotometric and flame photometric method respectively
- Demonstrate potentiometric and conductometric titrations

### List of Exercises

1. Preparation of Standard solutions.
2. Estimation of hardness of water by EDTA method.
3. Estimation of different types and amounts of alkalinity in water – Indicator method.
4. Determination of 'Dissolved Oxygen' – Winkler's method.
5. Estimation of iron in water – Spectrophotometer method.
6. Estimation of sodium in water – Flame Photometer method.
7. Determination of molecular weight of polymers – Viscometric method.
8. Determination of total dissolved solids in water.
9. Corrosion experiments:
  - Corrosion rate measurements.
  - Inhibition efficiency.
10. Electrochemistry experiments:
  - Determination of emf.
  - Single electrode potential.
  - Potentiometric and conductometric titration.

### REFERENCES

- 1 V. Venkateshwaran, R. Veeraswamy, A. R. Kulandaivelu, Basic Principles of Practical Chemistry, 2<sup>nd</sup> Edition, Sultan Chand & Sons, 1997

## **15BCEU0103 BASIC WORKSHOP**

C: 2, L: 0, T: 0, P: 3, CFA : 60, ESE : 40

### **Objectives:**

To familiarize with the basics of tools and equipments used in fitting, carpentry, sheet metal, welding and smithy. To familiarize with the production of simple models in the above trades.

### **UNIT I WELDING**

Tools and Equipments – Arc Welding of butt joint, Tap Joint, Tee fillet etc., Demonstration of gas welding.

### **UNIT II FITTING**

Tools and Equipments – Practice in Chipping, Filing, Drilling – making Vee joints, square and dove tail joints.

### **UNIT III CARPENTRY**

Tools and Equipments – Planning Practice – making halving joint and dove tail joint models

### **UNIT IV PLUMBING**

Tools and equipments – types of joints – treading - fitting

### **UNIT V SMITHY**

Tools and Equipments – Demonstration for making simple parts like keys, bolts etc.

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## **15YOGU0001 YOGA**

C: 1, L : 1, T : 0, P : 0, CFA: 50, ESE: -

**SEMESTER II**  
**15ENGU02X2 ENGLISH II**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

Syllabus offered by Faculty of English and Foreign languages of GRI

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**15MATU02C2 ENGINEERING MATHEMATICS II**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

**OBJECTIVES:**

- To have knowledge in multiple calculus
- To improve their ability in Vector calculus
- To equip themselves familiar with Laplace transform
- To expose to the concept of Analytical function
- To familiarize with Complex integration

**UNIT I ORDINARY DIFFERENTIAL EQUATIONS**

Higher order linear differential equations with constant coefficients –method of variation of parameters – Cuchy's and Legendre's linear equations – simultaneous first order linear equations with constant coefficients.

**UNIT II VECTOR CALCULUS**

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector fields – vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes Theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

**UNIT III ANALYTIC FUNCTIONS**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – construction of analytic functions – conformal mapping :  $w = z + c$ ,  $1/z$  and bilinear transformation.

**UNIT IV COMPLEX INTEGRATION**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions - Singular points- Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding poles on boundaries).

## UNIT V LAPLACE TRANSFORM

Laplace transform –conditions for existence –Transform of elementary functions-Basic properties –Transform of derivatives and integrals –Transform of unit step function and impulse functions –Transform of periodic functions. Definition of Inverse Laplace transform as contour integral –Convolution theorem (excluding proof ) –integral –convolution theorem (excluding proof) – initial and Final value theorems= Solutions of liner ODE o f second order with constant coefficients using Laplace transformation techniques.

### TEXT BOOK:

1. Bali N.P and Manish Goyal ,”Text book o f Engineering Mathematics”, 3<sup>rd</sup> Edition, Laxmi Publications (p) Ltd .,(2008).
2. Grewal B.S. “Higher Engineering Mathematics”, 50<sup>th</sup> Editions, Khanna publications, Delhi ,(2007).

### REFERENCES:

1. Ramman, B.V “Higer Engineering Mathematics” Tata Mc Graw HIL publishing company, New Delhi(2007)
2. Glyn James, “Advanced Engineering Mathematics”, 3rd Edition, Pearson (2007).
3. Erwin Kreyzig, Advance Engineering Mathematics “, Advance Engineering Mathematics”, 7<sup>th</sup> Edition, Wiley India, (2007).
4. Jain R.K And Iyengar S.R.K: “Advance Engineering Mathematics “, 3rd Edition, Narosa House Pvt. Ltd.,(2007).

## **15BCEU0204 CONSTRUCTION TECHNIQUES AND EQUIPMENTS**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

The main objective of this course is to make the student aware of the various construction techniques and equipments needed for different types of construction activities.

### **Specific Objectives of Learning:**

At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

### **UNIT I PRELIMINARY INVESTIGATION**

Principles of Planning - Planning regulations and bye-laws - Site works and setting out - Excavations and Timbering - Sub soil drainage - Electricity Lighting on Building sites - Winter building - Preparation of layout - Site Plan - Orientation of buildings.

### **UNIT II SUPER STRUCTURE**

Stone and Brick masonry - Composite masonry Load bearing walls - Cavity Walls - Partition walls - Reinforced Brick masonry. Flooring - Ground floors - Components - Types - suspended flooring - Upper floors - Types - Methods of laying. Roofs - Types of roofs -Types of Pitched roof - Shell roofs - Folded Plate roofs - Constructional Practices - Roof covering details. Staircase - Requirement of a good staircase - Types of staircase calculation for geometry - Ramps, Escalators, Lifts, and Types - Handling Capacity.

### **UNIT III SUB STRUCTURE**

Bearing capacity of soils - Soil investigations - Plate load Test - Methods of Improving bearing capacity - Shallow Foundation - Deep Foundations - Machine Foundations.

### **UNIT IV CONSTRUCTION TECHNIQUES**

Special construction techniques – Shorting, underpinning, Slip form construction, Vacuum dewatering – ready mix concrete – prepacked concrete – low cost techniques

### **UNIT V CONSTRUCTION EQUIPMENTS**

Uses of the following: plumb bob, spirit level, level tube, rammer, spade, shovels, straight edge, mortar pan, sieves, trolley, vibrators, bulldozers, drag lines, cable ways and belt conveyors, batching plants – transit mixers and vibratory trucks used for ready mix concrete – pumps – air compressors – hoist and cranes – choice of construction equipment for different types of works.

### **TEXT BOOKS:**

1. Arora S.P. and Bindra S.P., " Building Construction Planning Techniques and method of Construction " , Dhanpat Rai and Sons, New Delhi, 1997.
2. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, " Building Construction ", Laxmi Publications Pvt.Ltd., New Delhi, 1997.

### **REFERENCES:**

1. Chudley.R., "Construction Technology ", Vol.1, 2, 3, 4. ELBS Publisher, 1997.
2. " National Building Code of India ", Parts III, IV, VII and IX, 1983.

## **15BCEU0205 BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

To study the basics in the field of Electrical and Electronics Engineering system to meet the basic knowledge in Engineering.

### **Specific Objectives of Learning:**

Understand the basic concepts of magnetic circuits, AC & DC circuits. Explain the working principle, construction, applications of DC & AC machines and measuring instruments. To gain knowledge about the fundamentals of semiconductor devices and applications; Principles of digital electronics and Principles of various communication systems.

### **UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS**

Ohm's Law – Kirchhoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

### **UNIT II ELECTRICAL MECHANICS**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

### **UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS**

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

### **UNIT IV DIGITAL ELECTRONICS**

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

### **UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING**

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

### **TEXT BOOKS:**

1. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.
2. Sedha R.S., "Applied Electronics", S. Chand & Co., 2006.

### **REFERENCES:**

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, 2006.
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press 2005.
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 1994.
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum" Outline Series, McGraw Hill, 2002.
5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, 2003.

## **15BCEU0206 ENERGY & ENVIRONMENTAL SCIENCE**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

To study the basic energy sources, types, generation of sources into other sources and its applications

### **Specific Objectives of Learning:**

At the end the course the students familiar in types of energies, solar energy and the applications, wind energy, turbines, bio mass conversion technology, classification and pollution and its effects in Air, water and Solid wastes.

## **UNIT I INTRODUCTION**

Definition of Energy - Forms of Energy - Mechanical Energy - Chemical Energy and Fuels - Nuclear Energy - Hydro Energy - Renewable Energy - SWOT Analysis - Thermal Power plant: Layout- Accessories- Advantages- Limitations – Environmental Impacts - Nuclear Power plant- Nuclear Reactor- Power Plant Layout– Environmental Impacts - Hydro Electric Power Plant- Layout- Components– Environmental Impacts - Diesel Electric Power Plant- Layout- Field of Application– Environmental Impacts

## **UNIT II SOLAR ENERGY**

Solar Radiation Measurement- Solar Constant- Principle of operation of Solar Collectors- Flat Plate Collector- Efficiency- Trouble shooting- Concentrating Collectors- Application of Solar Energy- Water heating- Solar cooking- Solar Still- Solar pond- Solar Air Heating- Solar Drier- Solar PV power Generation- VI characteristics- Applications.- System available in the market

## **UNIT III WIND ENERGY**

Basic Principle of Wind Energy conversion- Site selection- Basic components of Wind Energy Conversion Systems- Classification- Horizontal & Vertical Axis wind Turbines- Advantages- Limitations- Solar Wind Hybrid systems.

## **UNIT IV BIOMASS ENERGY**

Bio mass conversion Technology- Factors affecting bio degradation- Classification of biogas generation0 Fuel properties- Utilization of biogas- Gasification- Classification of biomass gasifier- Pyrolysis. System available in the market including multifuel engines, New Renewable Energy Technologies – OTEC – Tidal – Geothermal – MHD

## **UNIT V        POLLUTION**

Definition – causes, effects and control measures of air pollution – particulate control devices - water pollution – sources – effects – characteristics of waste water – pH – BOD – COD – waste water treatment – Solid waste – source – classification – Incineration – Energy Recovery - Standards – ISO 15000 – World Environment Day

### **TEXT BOOKS:**

1. Rao,S. and Parulekar,R.B., Energy Technology - "Non-Conventional, Renewable and Conventional", Khanna Publishers, Delhi, 1995.
2. Rai, G.D., "Non-Conventional Sources of Energy", Khanna Publishers, Delhi 1995.

### **REFERENCE BOOKS:**

1. Venugopal,K. "Basic Mechanical Engineering" New Age International Private Ltd., New Delhi 1991.
2. Delhi 1991.
3. Gulp,A.G., "Principles of Energy Conversion" McGraw Hill Book Company, 1994.
4. T.D.Eastop & D.R.Croft, "Energy Efficiency for Engineers and Technologists" Longmen 1990

## **15BCEU0207 ENGINEERING MECHANICS**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

To understand the basics properties of surfaces, particles and solids in engineering aspects.

### **Specific Objectives of Learning:**

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

### **UNIT I BASICS AND STATICS OF PARTICLES**

Introduction – Units and dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular law of forces — Coplanar forces – Resolution and composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

### **UNIT II EQUILIBRIUM OF RIGID BODIES**

Free body diagram – Types of supports and their reaction s – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples - Scalar components of a moment – Varugnon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of rigid bodies in three dimensions – examples

### **UNIT III PROPERTIES OF SURFACES AND SOLIDS**

Determination of areas and volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section Angle section, Hollow section b y using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia

### **UNIT IV DYNAMICS OF PARTICLES**

Displacements, velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy equation of particles – Impulse and Momentum – Impact of elastic bodies.

## **UNIT V        FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS**

Frictional force – Laws of Coulomb friction – Simple contact friction – Rolling resistance – Belt friction. Translation and rotation of rigid bodies – Velocity and acceleration – General Plane motion.

### **TEXT BOOK:**

1. Beer, F.P. and Johnson Jr. E.R. “Vector Mechanics for Engineers”, Vol.1 Statics and Vol.2 Dynamics, McGraw-Hill International Edition, (1997).

### **REFERENCES:**

1. Rajasekaran, S. Sankarasubramanian, G., “Fundamentals of Engineering Mechanics”, Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeler, R.C. “Engineering Mechanics”, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd. (2000).
3. Palanichamy, M.S. Nagam, S. “Engineering Mechanics – Statics & Dynamics”, Tata McGraw-Hill, (2001).

## 15CSAU02C1 INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

C : 3+1, L : 3, T : 0, P : 2, CFA : 24+24, ESE : 36+16

### Objective:

To enable the students gain knowledge on the programming concepts in C

### Learning Outcomes:

Students should be able to

- Understand the Structure of C program.
- Understand about the control structures in C
- Familiarize the concepts of Functions.
- Develop programs using arrays
- Know the concepts of pointers.

Be able to develop basic programs in C.

**UNIT I:** History and development of Computers – need for a programming language – history of programming language.

**C Fundamentals :** Introduction to C Character set – data types – constants – identifiers – key words – operators and expressions – comment – Input and Output function in C

**UNIT II:** Control Statements: while do while for if else switch – break and continue statements – go to statement.

**UNIT III** Function: Defining a function – accessing a function – passing arguments to a function – recursion

**UNIT IV** Array: Defining an array – processing an array – single dimensional array – multidimensional array

**UNIT V** Pointers: Pointer declaration- passing pointers to a function – Dynamic storage allocation – File handling – open access modes – close.

### TEXT BOOK:

1. Programming in ANSI C, E.Balagurusamy, 5/e, Tata - McGraw Hill publishing, New Delhi, August 2010.

### REFERENCES:

1. Programming with C, B.S .Gottfried, Schaums outline Series, MCgraw - Hill Publishing Company, 1990.

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## 15BCEU0208 CONSTRUCTION PRACTICE LABORATORY

C: 2, L: 0, T: 0, P: 3, CFA: 60, ESE: 40

1. Identification of construction tools & equipments.
  2. Setting out a small building
  3. Bonding of Bricks and stones
  4. Flooring
  5. Formation of simple truss
  6. Cutting & Cranking of reinforcement
  7. Arrangement of reinforcement for beam, lintel cum sunshade, column & footing, slab.
  8. Plastering, Painting, Pointing
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## 15BCEU0209 COMPUTER AIDED DRAWING

C: 2, L: 0, T: 0, P: 3, CFA: 60, ESE: 40

### Objectives:

- To develop skill to use software to create 2D and 3D models.
- To draw the plan, section and elevation of buildings.

### List of Exercise using Software capable of Drafting and Modeling

1. Study of capabilities of Software for Drafting and Modeling – Coordinates systems (absolute, relative, polar, etc) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing curve a like parabola, spiral involutes using Baseline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone etc, and dimensioning.
5. Drawing front view, top view and side view of objects form the five pictorial views (eg V Block, Base of a mixture, Simple stool, Objects with hole and curves.
6. Drawing of a plan of residential building (Two bed rooms, Kitchen, hall etc).
7. Drawing of simple steel trusses.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc.,
9. Drawing isometric projection of simple objects.
10. Creation of 3 –D models of simple objects 2-D multi view drawings from 3-D model.
11. Buildings with load bearing walls (Flat and pitched roof) – Including details of door and windows
12. RCC framed structures
13. Industrial buildings – North light roof structures – Trusses
14. Perspective view of one and two storey buildings

### TEXT BOOKS:

1. Civil Engg. Drawing & House Planning – B.P. Verma, Khanna publishers, Delhi
2. Building drawing & detailing – Dr. Balagopal & T.S. Prabhu, Spades Publishers, Calicut.

### REFERENCES:

1. Building drawing – Shah, Tata McGraw-Hill
2. Building planning & Drawing – Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing
3. Shah, Kale and Patki, Building Drawing, Tata McGraw-Hill.

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15NSSU0001/15SHSU0001/15FATU0001/15SPOU0001 NSS/SHANTI SENA/FINE  
ARTS/SPORTS & GAMES

C: 2, L: 0, T: 0, P: 0, CFA: 50, ESE: -

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**SEMESTER III**  
**15MATU03C3 ENGINEERING MATHAMATICS III**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

**Objectives:**

- To know to formulate and solve partial differential equations
- To have thorough knowledge in fourier series
- To learn to solve boundary value problems
- To be familiar with applications of pde in two dimensional heat equation
- To gain good knowledge in the application of fourier transform

**UNIT I PARTIAL DIFFERENTIAL EQUATIONS**

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 partial differential equations of second and higher order with constant coefficients.

**UNIT II FOURIER SERIES**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

**UNIT III BOUNDARY VALUE PROBLEMS**

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

**UNIT IV FOURIER TRANSFORM**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

**UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS**

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

**TEXT BOOKS:**

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company Ltd., New Delhi, 1996.
3. Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.

**REFERENCES:**

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians," Macmillen , New York ,1988.
2. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

## 15BCEU0310 MECHANICS OF SOLIDS I

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### Objectives:

To study about the stresses and strains and their action on beams and trusses.

### Specific Objectives of Learning:

On completion of the course, the students will be able to determine the strength parameters of the materials and solve principal stress and principal plane problems and apply various methods of analysis of plane truss and determine shear force, bending moment, bending and shear stress distribution and analyze members subjected to torsion.

### UNIT I SIMPLE STRESSES AND STRAINS

Introduction – stress – strain – tensile, compressive and shear stress – elastic limits – Hooke's law – stress strain diagram – stresses in composite sections – Thermal stresses – Young's modulus – Rigidity modulus – Bulk modulus – Poisson's' ratio – Volumetric strain – Relationship between elastic constants.

### UNIT II SHEAR FORCE AND BENDING MOMENT

Introduction – types of beams – Cantilever – simply supported – over hanging – fixed and continuous beams – types of loads – concentrated load – uniformly distributed load – Uniformly varying load – Couples – Shear force and bending moment diagram for statically determinate beams (Cantilever, simply supported and over hanging) Relationship between load, shear force and bending moment.

### UNIT III BENDING AND SHEAR STRESSES

Centroid and moment of inertia of plane areas and compound section – Parallel and perpendicular axes theorems – Theory of simple bending – assumption – bending stresses in simply supported, cantilever beams Shear stress in beams – shear stress distribution

### UNIT IV TORSION OF CIRCULAR SHAFTS

Introduction – derivation of torsion equation – assumption – power transmitted by shafts – design of shafts – combined bending and torsion – introduction to non-circular sections.

### UNIT V SPRINGS AND CYLINDERS

Closed coiled and open coiled helical springs subjected to axial load.  
Thin cylinders – circumferential stress – longitudinal stress – volumetric strain stresses in thick cylindrical shell – Lamé's equation.

### TEXT BOOKS:

1. Punmia B.C. Ashok Kumar Jain and Arun Kumar Jain "Strength of Materials and Theory of Structures Vol I&II", Standard Publishers, New Delhi 1998.
2. Rajput, R.K. "Strength of Materials", Laxmi publications, New Delhi 1999

### REFERENCE BOOKS:

1. Surendra Singh, "Strength of Materials", Vikas Publishing House Pvt. Ltd., New Delhi, 1997
2. Bansal, R.K. "A text book of Strength of Materials", Laxmi Publications, New Delhi, 2001.
3. Timoshenko S.P. and Young D.H. "Elements of Strength of Materials", East West Press LTD., New Delhi 1978

## **15BCEU0311 MECHANICS OF FLUIDS I**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

1. To learn the importance, application and inter-relationship of various properties of fluid like mass density, viscosity, and surface tension. 2. To determine the forces on plane and curved surfaces in a fluid at rest and the concepts of buoyancy and metacentre.

### **Specific Objectives of learning:**

- Determine the properties of fluid and pressure and their measurement ,compute forces on immersed plane and curved plates ,continuity equation and energy equation in solving problems on flow through conduits ,compute the frictional loss in laminar and turbulent flows,analyse flow between reservoirs.

### **UNIT I        DEFINITIONS AND FLUID PROPERTIES**

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

### **UNIT II        FLUID STATICS & KINEMATICS**

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 – Velocity measurement (Pilot tube, current meter, Hot wire and hot film anemometer, float technique, Laser Doppler velocimetry).

### **UNIT III       FLUID DYNAMICS**

Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Moody diagram – Momentum Principle

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

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        SIMILITUDE AND MODEL STUDY**

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

### **TEXT BOOKS:**

1. Kumar, K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2. Garde, R.J. and Mirajgaoker, A.G., “Engineering Fluid Mechanics”, Nem Chand Bros., Roorkee
3. Rajput, R.K., “A text book of Fluid Mechanics in SI Units”
4. Fox, Robert, W. and Macdonald, Alan, T., “Introduction to Fluid Mechanics”, John Wiley & Sons, 1995

### **REFERENCES:**

1. Streeter, Victor, L. and Wylie, Benjamin E., “Fluid Mechanics”, McGraw-Hill Ltd., 1998.
2. E. John Finnemore and Joseph B. Franzini, “Fluid Mechanics with Engineering Applications”, McGraw-Hill International Edition.
3. Pernard Messay, “Mechanics of Fluids” 7<sup>th</sup> Edition, Nelson Thornes Ltd. U. K. 1998.

## **15GEOU03C1 APPLIED GEOLOGY**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Specific Objectives of learning:**

At the end of the course students will be able to

1. Describe the importance of Geology in Civil Engineering
2. Assess the role of structural features and rocks in civil constructions
3. Describe the different types of minerals and rocks
4. Predict the natural disasters to prevent failure of Civil Projects
5. Describe the investigating techniques for site selection

### **UNIT I PHYSICAL GEOLOGY**

Geology in Civil engineering – Branches of geology -structure of Earth and its composition-Weathering of rocks – Scale of Weathering – Soils-Landforms and processes associated with river, wind, groundwater and sea – relevance to Civil Engineering-Plate tectonics – Earthquakes – Seismic zones in India- Earthquake resistant buildings – design and construction

### **UNIT II STRUCTURAL GEOLOGY AND GEOPHYSICAL METHODS**

Geological maps – Attitude of beds-Study of Structures – Folds, Faults and Joints – Relevance to Civil Engineering-Geophysical methods – Seismic and electrical methods for subsurface investigations- Stratigraphy of India – economic and engineering significance

### **UNIT III MINERALOGY AND PETROLOGY**

Definition of mineral. Physical properties of minerals-Physical properties of important rock forming minerals - Quartz, Feldspar, Mica, Pyroxene, Amphibole, Olivine, Garnet, Epidote and Beryl.-Rocks and its Classification.-Mode of formation of Igneous rocks. Chief forms of Igneous bodies-Structures and Textures of Igneous Rocks-Description of important Igneous Rocks: Granite, Syenite, Diorite, Obsidian, Pumice, Trachyte and Basalt. -Sedimentary Rocks – Mode of formation and classification-Description of important Sedimentary Rocks: Sandstone, Shale, Limestone and Laterite-Metamorphic Rocks – Mode of formation-Important Rocks- Slate, Phyllite, Schist, Gneiss, Marble and Charnockite.

### **UNIT IV HYDROGEOLOGY AND ENGINEERING GEOLOGY**

Hydrological cycle-Origin and occurrence of Groundwater-Vertical distribution of Groundwater-Hydrogeological properties of rocks – Porosity, Permeability-Aquifer and its types, Aquifuge, Aquiclude and Aquitard.

### **UNIT V ROLE OF GEOLOGY IN CIVIL ENGINEERING**

Site investigating technics for Civil Engineering Projects-Remote sensing and GIS for Civil Engineering Applications-Geological conditions necessary for Design and Construction of Dams and Reservoirs-

Geological conditions necessary for Design and Construction of Tunnels and Road cuttings-  
Hydrogeological Investigations and Mining-Coastal protection structures-Investigation of Landslides,  
causes and Mitigation-Methods of improvement of sites

**TEXTBOOKS:**

1. D Venkat Reddy (2013), Engineering Geology; Vikas Publishing.
2. Parbin Singh, (2013), Engineering Geology,S.K. Kataria & Sons.

**REFERENCES:**

1. H K Panday (2014), Engineering Geology; Mc Graw Hill Education, New Delhi,.
2. S.K. Garg (2012), Physical and Engineering Geology; Khanna Publishers.
3. Krynine and Judd (2005), Principles of Engineering Geology and Geotechnics; CBS publication.

## **15BCEU0312 SURVEYING I**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

- To understand the importance of surveying in the field of civil engineering and to study the basics of linear/angular measurement methods like chain surveying, compass surveying and the significance of plane table surveying in plan making and know the basics of levelling and theodolite survey in elevation and angular measurements

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### **Specific Objectives of Learning:**

- On completion of the course, the students will be able to carry out preliminary surveying in the field of civil engineering applications such as structural, highway engineering and geotechnical engineering and plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse and use various conventional instruments involved in surveying with respect to utility and precision.

### **UNIT I INTRODUCTION AND CHAIN SURVEYING**

Definition - Principles - Classification - Field and office work - Scales - Conventional signs - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Setting perpendiculars - well - conditioned triangles - Traversing - Plotting - Enlarging and reducing figures.

### **UNIT II COMPASS SURVEYING AND PLANE TABLE SURVEYING**

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

### **UNIT III LEVELLING AND APPLICATIONS**

Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs.

#### **UNIT IV THEODOLITE SURVEYING**

Theodolite - Vernier and microptic - Description and uses - Temporary and permanent adjustments of vernier transit - Horizontal angles - Vertical angles - Heights and distances - Traversing - Closing error and distribution - Gale's tables - Omitted measurements.

#### **UNIT V ENGINEERING SURVEYS**

Reconnaissance, preliminary and location surveys for engineering projects - Lay out - Setting out works - Route Surveys for highways, railways and waterways - Curve ranging - Horizontal and vertical curves - Simple curves - Setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances - Mine Surveying - instruments - Tunnels - Correlation of underground and surface surveys - Shafts - Adits.

#### **TEXT BOOKS:**

1. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
2. Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.
- 3.

#### **REFERENCES:**

1. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi,
2. Sixth Edition, 1971.
3. James M.Anderson and Edward M.Mikhail, Introduction to Surveying, McGraw-Hill Book
4. Company, 1985.
5. Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.
6. Punmia B.C. Surveying, Vols. I, II and III, Laxmi Publications, 1989

## **15BCEU0313 CONCRETE TECHNOLOGY**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

To understand the properties of ingredients of concrete and various applications relative to satisfy the requirement in the construction field

### **Specific Objectives of learning:**

To study the behavior of concrete at its fresh and hardened state and to study about the concrete mix design by various methods to reach the target strength. Study the various types of concretes and concreting methods and their specific applications ensure quality control while testing/sampling and acceptance criteria.

### **UNIT I PROPERTIES AND TESTING OF CEMENT, AGGREGATES, FRESH CONCRETE & ADMIXTURES**

Cement – history of Cement – Composition - manufacturing process – types of Cement - heat of hydration - tests for cement - Aggregates – sources of aggregates – types of aggregates - tests for aggregates – Fresh Concrete - Properties of fresh concrete – workability – testing of fresh concrete - Admixtures – functions, classification, types: mineral and chemical, IS: specifications (9103 and 456), compatibility of admixtures.

### **UNIT II PROPERTIES AND TESTING OF HARDENED CONCRETE**

Testing of hardened concrete – Engineering properties of concrete Elasticity – Creep and shrinkage, ductility - factors affecting the properties – chemical attack on concrete – other properties failure criteria of concrete – Non destruction testing methods.

### **UNIT III SPECIAL CONCRETE AND CONCRETING METHODS**

Lightweight concrete – High density concrete – Fibre reinforced concrete – polymer concrete – Types - application – Special concreting methods – Cold weather concreting – Hot weather concreting – Sulphur Infiltrated concrete - prepacked concrete - Vacuum concrete - gunite / shotcrete – Ferrocement – applications.

### **UNIT IV MIX DESIGN BY VARIOUS METHODS**

Methods of concrete mix design - concept of mix design - variables in proportioning – common terminologies – calculation of standard deviation – coefficient of variation – relation between average design strength and specified minimum strength - factors affecting concrete mix design – concrete mix design by Indian Standard method – ACI method – DOE method of concrete mix design.

### **UNIT V STATISTICAL, QUALITY CONTROL & CORROSION**

Statistical & Quality control of concrete – Qualities of water – use of sea water for mixing concrete - Corrosion in concrete – effects – corrosion of steel - prevention from corrosion.

### **TEXT BOOK:**

1. M.S.Shetty., “Concrete Technology Theory and Practice” S.Chand & Company Limited, New Delhi, 2011.

### **REFERENCE BOOKS:**

1. Gambhir.M.L, “Concrete Technology Theory and Practice” 5<sup>th</sup> Edition, Tata McGraw Hill Education Pvt.Ltd, New Delhi, 2013.
2. Neville A.M, Brooks J.J, “Concrete Technology” Pearson Education Ltd., New Delhi, 2008.
3. A.R.Santhakumar., “Concrete Technology” Oxford University Press-New Delhi, 2006.

## **15SOCU03A1 SOCIO ECONOMIC STRUCTURE AND SUSTAINABLE DEVELOPMENT**

C: 2, L: 2, T: 0, P: 0, CFA: 40, ESE: 60

### **UNIT I**

Rural sociology-concepts nature and subject matter, Rural Social structure. Social institutions : family, marriage, Knship, caste.

### **UNIT II**

Rural Economics : characteristics of rural economy, Jajmani system development of agriculture and programmes of development for various industries, market economy impact of globalization in rural economy.

### **UNIT III**

Village Administration : Panchayatiraj, village panchayat : its organization functions and finances, Role of panchayats in rural development.

### **UNIT IV**

Social change and Technology : Social change Factors responsible for change in rural communities : Technology as a change factor. Sustainable development – Social development-Critical appraisal.

### **UNIT V**

Needs of the changing rural society. The subject matter covered – by XI schedule of 73<sup>rd</sup> Amendment : Challenges in transaction. Global and Local connectivities MDGs and PURA

### **TEXT BOOKS:**

1. Chithambar JB., Introductory Rural Sociology, New Age International Publications, New Delhi.
2. N.P.Joshi and G.S.Narwani, Panchayatiraj in India, Emerging Trends across the States, Rawat Publications, New Delhi, 2000.

### **REFERENCE BOOKS:**

1. Katar Singh, Rural Development, Principles Policies and Management, Sage Publications, New Delhi, 1999.
2. S.L. Dosh and P.C. Jain, Rural Sociology, Rawat Publications, New Delhi, 1999.
3. Rajendra K. Sharma Fundamentals of Sociology, Atlantic Publishers and Distributors, New Delhi, 1997
4. G.R.Madan, Indian Rural Problems, Radha Publications, New Delhi, 2003
5. Andre Beteille, Caste, Class and Power, changing patterns of stratification in a Tanjore village, Oxford University Press, New Delhi, 1999.
6. B.Kuppusamy, Social Change in India.....

## 15GTPU0001 GANDHI'S LIFE, THOUGHT AND WORK

C: 2, L: 2, T: 0, P: 0, CFA: 20, ESE: 30

### Objectives

1. To enable students to understand and appreciate the principles and practices of Gandhi and their relevance in the contemporary times.
2. To develop character and attitude to follow Gandhian values and responsibilities in their personal and social life.

### Specific Objectives of Learning:

This will make the students:

- To understand the life of Gandhiji in-depth.
- To get introduced to the relevant Gandhian philosophies.
- To apply the Gandhian concepts in the relevant context.
- To envision the Gandhian socio-economic, political and cultural ideas.
- To get educated on Gandhian lines in a multi-dimensional way.

**Unit 1:** Life of Gandhi in brief: Early life in India – London Phase – South African Adventure-Struggle for total freedom in India – Martyrdom

**Unit II:** Concepts of Gandhi's Philosophy, Truth and Nonviolence, Ends and Means, Right and Duties, Simply Living and High Thinking

**Unit III:** Gandhi's concepts and their applications: Sarvodaya, Satyagraha, Santhi Sena Constructive Work

**Unit IV:** Gandhian Vision of Society: Self and society-Communal harmony, removal of untouchability and Equality of sexes – Policies: Decentralization of power, Gram Swaraj(Panchayatui Raj) and good governance-Economics of Swadeshi, Trusteeship, Bread Labour and Self-employment.

**Unit V:** Gandhian Dimension of Education: Basic Education, Adult Education, Pluralism-Multilingualism, Religions and interfaith relations-Health; Diet, Nature Cure, Education on Health, Sanitation and Hygiene.

### REFERENCES:

1. M.K. Gandhi: (1983), An Autography of the Story of My Experiments with Truth, Navajivan Publishing House, Ahmedabad.
2. M.K. Gandhi: (1951), Satyagraha in South Africa: Navajivan Publishing House, Ahamadabad.
3. M.K. Gandhi: (1983), Construtive Programme" Its Meaning and Place. Navajivan Publishing House, Ahamadabad.
4. M.K. Gandhi: (1948) Key to Health, Navajivan Publishing House, Ahamadabad.
5. M.K. Gandhi: (1949), Diet and Diet Reforms, Navajivan Publishing House, Ahamadabad.
6. M.K. Gandhi: Basic Education, Navajivan Publishing House, Ahamadabad.
7. M.K. Gandhi: (2004), Village Industries, Navajivan Publishing House, Ahamadabad.
8. M.K. Gandhi: (1962), Hindi Swaraj, Navajivan Publishing House, Ahamadabad.
9. M.K. Gandhi: (2004), Trusteeship Dreams, Navajivan Publishing House, Ahamadabad.
10. M.K. Gandhi: (2001), India of my Dreams, Navajivan Publishing House, Ahamadabad.
11. M.K. Gandhi: Self Restraint Vs. Self Indulgence, Navajivan Publishing House, Ahamadabad.
12. Arunachalam: Gandhi: (1985), The Peace Maker, Gandhi Samarak Nidhi, Madurai
13. R.R. Prabhu & UR Rao. The Mind of Mahatma Gandhi, Navajivan Publishing House.

## **15BCEU0314 SURVEY PRACTICAL I**

C: 2, L: 0, T: 0, P: 3, CFA: 60, ESE: 40

### **Objectives:**

To study the practical experiments in chaining, compass, plane table and the practical application of levelling and theodolite.

### **Specific outcomes of learning:**

On completion of the course, the students will be able to use conventional surveying tools such as chain/tape, compass, plane table, level in the field of civil engineering applications such as structural plotting and highway profiling and to apply the procedures involved in field work and to work as a surveying team and to plan a survey appropriately with the skill to understand the surroundings and take accurate measurements, field booking, plotting and adjustment of errors can be understood and plot traverses / sides of building and determine the location of points present on field on a piece of paper

### **List of Exercise:**

1. At the end of the course the student will possess knowledge about Survey field techniques
2. Study of chains and its accessories
3. Aligning, Ranging and Chaining
4. Chain Traversing
5. Compass Traversing
6. Plane table surveying: Radiation
7. Plane table surveying: Intersection
8. Plane table surveying: Traversing
9. Plane table surveying: Resection –Three point problem
10. Plane table surveying: Resection – Two point problem
11. Study of levels and levelling staff
12. Fly levelling using Dumpy level
13. Fly levelling using tilting level
14. Check levelling
15. Longitudinal Section and Cross Section
16. Contouring

## **15BCEU0315 STRENGTH OF MATERIALS LABORATORY**

C: 2, L: 0, T: 0, P: 3, CFA: 60, ESE: 40

### **Objectives:**

- Learn the properties of different materials like steel, concrete, brick.
- Study the behaviour of different structural elements by conduct of different tests like tension.

### **List of Exercise:**

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 vs. angle of twist and hence the
  4. stiffness
  5. Test involving flexure to obtain the load deflection curve and hence the stiffness
  6. Tests on springs
  7. Hardness tests(Brinell , Rokwell and Vicker )
  8. Shear test(Single and Double)
  9. Test on Cement
  10. Impact test (charpy and Izod)
  11. Verification of maxwells law of reciprocal theorem
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## **15EXNU03V1 VILLAGE PLACEMENT PROGRAMME**

C: 2, L: 0, T: 0, P: 0, CFA: 0, ESE: 0

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**SEMESTER IV**  
**15MATU04C4 NUMERICAL METHODS**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

**Objectives:**

To make the students be familiar with the basic concepts in numerical methods and their uses.

**Specific Objectives of Learning:**

At the end of the course, the students would be acquainted with 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. When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values. The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.

Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

**UNIT I        SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**

Linear interpolation methods (method of false position) – Newton's method – Statement of fixed point theorem – Fixed point iteration:  $x=g(x)$  method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods - Iterative methods: Gauss Jacobi and Gauss-Seidel methods - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method.

**UNIT II        INTERPOLATION AND APPROXIMATION**

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

**UNIT III       NUMERICAL DIFFERENTIATION AND INTEGRATION**

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons's rules.

#### **UNIT IV :INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS**

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

#### **UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

#### **TEXT BOOKS:**

1. C.F. Gerald and P.O. Wheatley, 'Applied Numerical Analysis', Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. E. Balagurusamy, 'Numerical Methods', Tata McGraw Hill Pub.Co.Ltd, New Delhi, 1999.

#### **REFERENCES:**

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, 'Numerical Methods', S.Chand Co. Ltd., New Delhi, 2003.
2. R.L. Burden and T.D. Faires, 'Numerical Analysis', Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.

## 15BCEU0416 MECHANICS OF SOLIDS II

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

To study the different methods of finding deflection of beam and to analyze the Indeterminate beams subjected to various loading and to study the different methods to find the deflection of truss and to analyze the column with different end conditions

### **Specific Objectives of learning:**

On completion of the course, the students will be able to determine deflection of a beam for various loading conditions and to apply unit load method to find the deflection of truss and to visualize the behavior of column for combined bending and axial loading

## **UNIT I      STATICALLY DETERMINATE STRUCTURES**

Determination of deflection curve – Macaulay's method – Area moment method – Conjugate beam method – Strain energy approach.

## **UNIT II      STATICALLY INDETERMINATE STRUCTURES**

Beams – Propped, fixed and Continuous beams – Theorem of three moments – Calculation of reactions, B.M. and S.F. – Shear force and bending moment diagrams.

## **UNIT III      ENERGY THEOREMS AND ITS APPLICATION TO BEAMS & TRUSSES**

Applications using Castigliano; I theorem, castigliano's II theorem, Maxwell's reciprocal theorem – Dummy unit load method.

## **UNIT IV      THEORY OF COLUMNS**

Axial load – combined bending and axial load, Euler's formula for long struts – Practical applications – Rankine Gordon's formula.

## **UNIT V      ANALYSIS OF TRUSS**

Truss – methods of joints – methods of sections – graphical method. Deflection of truss : By Williot Mohr's diagram.

### **TEXT BOOKS:**

1. Strength of materials – R.K. Rajput, Laxmi Publications
2. Strength of materials – R.K. Bansal, Laxmi Publications
3. Solid Mechanics – Kaximi – Tata McGraw Hill, Delhi.

### **REFERENCES:**

1. Mechanics of materials – S.P. Timshenko & J.M. Gara, CBS Publishers, Delhi.
2. Introduction to mechanics of solids – Eger G. Popov
3. Theory and analysis of Structures – O.P. Jain & B.K. Jain
4. Graphical Methods in Structural Analysis – D.S. Prakash Rao, University Press. Analysis of Indeterminate structures – C.K. Wang, Tata McGraw- Hill

## **15BCEU0417 MECHANICS OF FLUIDS II**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

1. To study the measurement of pressure of fluid in pipes using various devices like manometers, mechanical gauges.
2. To study the measurement of velocity and discharge using weirs, notches, venturimeter etc. 3. To study open channel flow through Chezy's, Manning's, Kutter's formulae; economical channel sections, hydraulic jump; introduction to irregular flows.
4. To understand the components, function, and uses of centrifugal and reciprocating pumps.
5. To understand the components, function, and uses of Pelton wheel, Kaplan and Francis turbines.

### **Specific Objectives of Learning:**

On completion of the course, the students will be able to:

- visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe, flow measurement through orifices, mouth pieces, notches and weirs.
- analyze fluid flows in open channel hydraulics and devices such as weirs and flumes.
- apply dimensional analysis and the concept of CFD.
- design open channels for most economical sections like rectangular, trapezoidal and circular sections.
- measure velocity through instruments in open channel and pipe flow.

### **UNIT I OPEN CHANNEL FLOW**

Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation.

### **UNIT II UNIFORM FLOW**

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 III VARIED FLOW**

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

## **UNIT IV      HYDRAULIC JUMPS**

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

## **UNIT V      PUMPS AND TURBINES**

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 - similarity laws - centrifugal pump - minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels -indicator diagram and its variation - savings in work done - rotary pumps.

### **TEXT BOOKS:**

1. Subramanya K., "Flow in Open channels", Tata McGraw-Hill Publishing Company, 1994.
2. Bansal R.K., “Fluid Mechanics & Hydraulic Machines”, Lakshmi publications, 2006

### **REFERENCES:**

1. Kumar K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, (7th Edition), 1995.
2. Jain A.K., "Fluid Mechanics (including Hydraulic Machines)", Khanna Publishers, 8th edition, 1995.
3. Ranga Raju, K.G., “Flow through Open Channels”, Tata McGraw-Hill.
4. Ven Te Chow, “Open-Channel Hydraulics”, McGraw-H: Q Book company, 1996.
5. Ramamirtham S., “Fluid Mechanics, Hydraulics and Fluid Machines”, Dhanpat Rai & Sons, Delhi, 1998.
6. John A. Roberson, “Hydraulic Engineering”, Jaico Publishing House, 1998.

## **15BCEU0418 SURVEYING II**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **OBJECTIVES:**

To learn about surveying applications in setting out of curves, buildings, culverts and tunnels and to get introduced to different geodetic methods of survey such as triangulation, trigonometric leveling and to learn about errors in measurements and their adjustments in a traverse and to get introduced to modern advanced surveying techniques involved such as Remote sensing, Total station, GPS, Photogrammetry etc and to understand tacheometric surveying in distance and height measurements

### **Specific Objectives of Learning:**

On completion of the course, the students will be able to carry out a geodetic survey, taking accurate measurements using instruments and adjusting the traverse apply mathematical adjustment of accidental errors involved in surveying measurements and to plan a survey for applications such as road alignment and height of the building and to involve advanced surveying techniques over conventional methods in the field of civil engineering

### **UNIT I TACHEOMETRIC SURVEYING**

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

### **UNIT II CONTROL SURVEYING**

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to centre - Trigonometric levelling - Single and reciprocal observations - Modern trends – Bench marking

### **UNIT III SURVEY ADJUSTMENTS**

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

### **UNIT IV ASTRONOMICAL AND MODERN SURVEYING**

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Different time systems - Nautical almanac - Star constellations - Practical astronomy - Field observations and calculations for azimuth. Total Station – Use of GPS – Other Instruments

## **UNIT V        OTHER TOPICS**

Photogrammetric - Introduction - Terrestrial and aerial Photographs - Stereoscopy - Parallax - Electromagnetic distance measurement - Carrier waves - Principles - Instruments - Trilateration - Hydrographic Surveying - Tides - MSL - Sounding methods - Location of soundings and methods - Three point problem - Strength of fix - Sextants and station pointer - River surveys - Measurement of current and discharge .

### **TEXT BOOKS:**

1. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
2. Punmia B.C., Surveying, Vols. I, II and III, Laxmi Publications, 1989.

### **REFERENCES:**

1. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
2. James M.Anderson and Edward M.Mikhail, Introduction to Surveying, McGraw-Hill Book Company, 1985.
3. Wolf P.R., Elements of Photogrammetry, McGraw-Hill Book Company, Second Edition, 1986.
4. Robinson A.H., Sale R.D. Morrison J.L. and Muehrche P.C., Elements of Cartography, John Wiley and Sons, New York, Fifth Edition, 1984.
5. Heribert Kahmen and Wolfgang Faig, Surveying, Walter de Gruyter, 1995.
6. Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.

## **15BCEU0419 SOIL MECHANICS**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

To study the types of soil and its classification systems, calculation of stresses and its distribution and its strength and stability.

### **Specific Objectives of learning:**

Provide the description, classification and to know about properties of soil. Familiarize the students an understanding of permeability and seepage of soils .To know about the consolidation and compaction effect on soil in lab and field. To develop an understanding of the principles of effective stress in saturated soils, and its application to various soil condition and to know the shear strength of the soils. To have exposure on the concept of slope stability.

### **UNIT I INTRODUCTION**

Nature of soil – Problems with soil – phase relation – Grain size distribution – sieve analysis – sedimentation analysis – Atterberg limits – classification for engineering purposes – BIS classification system – Soil compaction – factors affecting compaction – field compaction methods and monitoring.

### **UNIT II SOIL WATER AND WATER FLOW**

Soil water – Various forms – Influence of clay minerals – Capillary rise – Suction – Effective stress concepts in soil – Total, neutral and effective stress distribution in soil – Permeability – Darcy's Law – Permeability measurement in the laboratory – quick sand condition – Seepage – Laplace Equation – Introduction to flow nets – properties and uses – Application to simple problems.

### **UNIT III STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT**

Stress distribution in soil media – Boussinesque formula – stress due to line load and Circular and rectangular loaded area – approximate methods – Use of influence charts – Westergaard equation for point load – Components of settlement Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – governing differential equation – laboratory consolidation test – Field consolidation curve – NC and OC clays – problems on final and time rate of consolidation.

### **UNIT IV SHEAR STRENGTH**

Shear strength of cohesive and cohesion less soils – Mohr.- Coulomb failure theory – Saturated soil and unsaturated soil (basics only) – Strength parameters – Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests – Types of shear tests based on drainage and their applicability – Drained and undrained behavior of clay and sand – Stress path for conventional triaxial test.

## **UNIT V        SLOPE STABILITY**

Slope failure mechanisms – Modes – Infinite slopes – Finite slopes – Total and effective stress analysis – Stability analysis for purely cohesive and C-  $\phi$  soil – Method of slices – Modified Bishop's method – Friction circle method – stability number – problems – Slope protection measures.

### **TEXT BOOK:**

1. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Soil Mechanics and Foundations" 16<sup>th</sup> Edition, Laximi Publications Pvt., Ltd., New Delhi, 2005.

### **REFERENCES:**

1. Venkatramaiah, C, "Geotechnical Engineering", 3<sup>rd</sup> Edition, New Age International Publishers, New Delhi, 2011.
2. Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2007.
3. Murthy V.N.S, "Soil Mechanics and Foundation" UBS Publishers Distribution Lts., New Delhi, 1999.

## **15BCEU0420 HIGHWAY ENGINEERING**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

### **Objectives:**

The objective of the course is to educate the students on the various components of Highway Engineering. It exposes the students to highway planning, engineering surveys for highway alignment, Design of Geometric Elements of Highways and Urban roads, Rigid and Flexible pavements design. The students further learn the desirable properties of highway materials and various practices adopted for construction. This course enables the students to develop skill on evaluation of the pavements and to decide appropriate types of maintenance.

### **Specific Objectives of learning:**

On completion of the course, the students will be able to:

- carry out surveys involved in planning and highway alignment
- design cross section elements, sight distance, horizontal and vertical alignment
- implement traffic studies, traffic regulations and control, and intersection design
- determine the characteristics of pavement materials
- design flexible and rigid pavements as per IRC

### **UNIT I HIGHWAY PLANNING AND ALIGNMENT**

Tresaguet and Macadam's method of Road Construction, Highway Development in India - Jayakar Committee Recommendations and Realizations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques) Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Cross sections of different Class of Roads.

### **UNIT II GEOMETRIC DESIGN OF HIGHWAYS**

Design of Horizontal Alignments – Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] Geometric Design of Hill Roads [IRC Standards Only]

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

Rigid and Flexible Pavements- Components and their Functions, Design Principles of Flexible and Rigid Pavements, Factors affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic Design Practice for Flexible Pavements [CBR method, IRC Method and Recommendations- Problems] Design Practice for Rigid Pavements – [IRC Recommendations-Problems] – Joints

### **UNIT IV      HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE**

Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) 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 - Penetration, Ductility, Viscosity, Binder content and Softening point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]

### **UNIT V      HIGHWAY MAINTENANCE**

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 – and Special Repairs. Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of pavement Failure and strengthening - Overlay design by Benkelman Beam Method [Procedure only], Principles of Highway Financing

#### **TEXT BOOKS:**

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000.

#### **REFERENCES:**

1. IRC Standards (IRC 37 - 2001 & IRC 58 -1998)
2. Bureau of Indian Standards (BIS) Publications on Highway Materials
3. Specifications for Road and Bridges, MORTH

## **15BCEU0421 SOIL MECHANICS LABORATORY**

C: 2, L: 0, T: 0, P: 3, CFA: 60, ESE: 40

### **Objectives:**

To study the various properties of soil by this listed tests.

### **Specific Objectives of Learning:**

At the end of this course, students are familiarize in the determining the various properties of soil by the suitable methods and acquire knowledge in the application of the methods of tests in the laboratory and field.

### **LIST OF EXPERIMENTS**

1. Moisture Content Determination any one of the following method
  - (a) Oven- drying Method
  - (b) Pycnometer method
  - (c) Speedy Moisture meter method
  - (b) Infra-red lamp and Torsion Balance method.
2. Specific Gravity and Relative Density Test for sand (Pycnometer, Density bottle and Relative density test apparatus).
3. Sieve analysis for coarse grained soil (set of sieve and sieve shaker)
4. Hydrometer analysis for fine grained soil (Hydrometer)
5. Consistency Limits and indices (Liquid limit, Plastic limit and Shrinkage limit apparatus)
6. Field Density Test (Sand replacement and core cutter method)
7. Standard Proctor's Compaction Test (standard Proctor Compaction Test apparatus)
8. Constant and Variable Head Permeability Tests (Universal Permeameter)
9. Consolidation Test (Consolidometer)
10. Direct shear test on sand (Direct shear test apparatus)
11. Triaxial compression test for cohesive soil without pressure measurement (Triaxial Testing machine with constant pressure set up)
12. Unconfined Compression Test for Cohesive Soil (Load frame and samples)
13. Vane Shear strength for cohesive soil (Vane Shear test apparatus)

### **TEXT BOOKS:**

1. Alam Singh and Chowdhary, G.R., "Soil Engineering in Theory and Practice, Volume-2, Geotechnical testing and instrumentation, CBS Publishers and Distributors, New Delhi, 2006
2. Punmia, B.C, "Soil Mechanics and foundations" Laximi publication pvt.Ltd., New Delhi, 2005.

### **REFERENCE BOOKS:**

1. Bowles, J.E., Engineering properties of soils and their measurements, McGraw Hill, 1992.
2. Lambe T.W., Soil Testing for Engineers", John Wiley and Sons, New York, 1990.

## 15BCEU0422 SURVEY PRACTICAL II & SURVEY CAMP

C: 2, L: 0, T: 0, P: 3, CFA: 60, ESE: 40

### Objectives:

To conduct experiments related to finding height and distances by tacheometric surveying and to conduct setting out of simple curve for construction of road purposes and to study the co-ordinate measurements by GPS and traversing by Total station.

### Specific Objectives of Learning:

On completion of the course, the students will be able to use the theodolite along with chain/tape, compass on the field and to apply geometric and trigonometric principles of basic surveying calculations and to employ drawing techniques in the development of a topographic map using modern survey equipments

### List of Exercise:

1. Study of Theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles
3. Theodolite survey traverse
4. Heights and distances - Triangulation - Single plane method.
5. Tachometry - Tangential system - Stadia system - Subtense system.
6. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition curve.
7. Field observation for and Calculation of azimuth
8. Demonstration of EDM, Total Station and GPS
9. Exercise in Total Station (Distance measurements, Area Calculations)
10. Exercise in GPS(point, line, polygon)

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## SURVEY CAMP

### Objectives:

Depending upon the field, various methods of chaining, traversing, leveling, GPS and total station can be adopted to get wide experience in the camp.

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## **15BCEU0423 FLUID MECHANICS LABORATORY**

C: 2, L: 0, T: 0, P: 3, CFA: 60, ESE: 40

### **Objectives:**

**Student should be able to verify the principles studied in theory by conducting the experiments.**

### **Specific Objectives of learning:**

On completion of the course, the students will be able to:

- measure discharge in pipes
- determine the energy loss in conduits
- demonstrate the characteristics curves of pumps
- demonstrate the characteristics curves of turbines
- carry out discharge measurements in open channel

### **List of Experiments:**

1. Determination of co-efficient of discharge for orifice( constant head , variable head method)
  2. Determination of co-efficient of discharge for mouth piece( constant head , variable head method)
  3. Determination of co-efficient of discharge for triangular notch
  4. Determination of co-efficient of discharge for triangular notch
  5. Determination of co-efficient of discharge for venturimeter
  6. Determination of co-efficient of discharge for orifice meter
  7. Study of impact of jet on flat plate (normal/inclined)
  8. Study of friction losses in pipes
  9. Study of minor losses in pipes
  10. Study on performance characteristics of Pelton turbine
  11. Study on performance characteristics of Francis turbine
  12. Study on performance characteristics of Kaplan turbine
  13. Study on performance characteristics of Centrifugal pumps (Constant speed/ variable speed)
  14. Study on performance characteristics of reciprocating pump
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## **15BCEU0424 SUMMER INTERNSHIP**

C: 2, L: 0, T: 0, P: 0, CFA: 100, ESE: 0

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**SEMESTER V**  
**15APRU0001 ELEMENTS OF RESEARCH METHODS**

C: 3, L: 3, T: 0, P: 0, CFA: 40, ESE: 60

**Objective:**

To understand the basics, methods and procedures of research, and acquire knowledge in data analysis.

**Specific Objectives of Learning:**

Upon completion of the course, the students will be able to:

- Identify and formulate a problem for research.
- choose the appropriate tools and techniques of data collection
- prepare a suitable research design to carryout research
- learn different methods of sampling
- write research report to suit their purpose

**UNIT - 1:** Research – Definition, Objectives, characteristics and types of research - Steps in research – Selection of problem for research – Sources of review of literature – Hypothesis: concept and characteristics

**UNIT - 2:** Research Design – Need and components of research design, Methods of research – experimental, descriptive studies, case study, and market survey.

**UNIT - 3:** Data Collection – Sources of data, Data Collection tools and techniques – observation, interview, schedule, and questionnaire. Research Report – Types of research report – Format of a research report.

**UNIT - 4:** Sample Vs Census methods: Sampling methods, Processing of Data – scoring, coding, classification and tabulation of data, diagrammatic, and graphical presentation.

**UNIT - 5:** Data Analysis – Correlation analysis - mean, median and mode; Range and Standard Deviation, and Uses of Software in data analysis.

**TEXT BOOKS:**

1. Krishnaswami O.R., & M.Ranganatham, Methodology of Research in Social Sciences, Mumbai : Himalaya Publishing House, 2010
2. Gupta S.C., Fundamentals of Statistics, Mumbai : Himalaya Publishing House, 2006.
3. Hans Raj, Theory and Practice in Social Research, Delhi: Surjeet Publications, 2002
4. Nakkiran S and Selvaraju R., Research Methods in Social Sciences, Mumbai Himalaya Publishing House, 2001.
5. Manoharan M., Statistical Methods, Palani : Paramount Publishers, 1997

**REFERENCES:**

1. Vijayalakshmi G. & Sivapragasam C., Research Methods: Tips and Techniques, Chennai : MJP Publishers, 2009.
2. Sadhu A.N. and Singh, A. Research Methodology in Social Sciences, Mumbai: Himalaya Publishing House, 2005.
3. Kothari C.R., Research Methodology, New Delhi : Vishva Prakashan, 2001.
4. Basotia G.R., Sharma K.K., Research Methodology, Jaipur (India) : Mangal Deep Publications, 1999.
5. Gosh B.N., Scientific Methods and Social Research, New Delhi: Sterling Publishers, 1997.

## **15BCEU0525 FOUNDATION ENGINEERING**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

To study the various methods of soil investigation, load bearing capacity of soil and the suitable types of foundation.

### **Specific Objectives of learning:**

Familiarize the students with a basic understanding of the essential steps involved in a geotechnical site investigation. Introduce the principal types of foundations and the factors governing the choice of the most suitable type of foundation for a given solution and familiarize the students with the procedures used for: a) bearing capacity estimation, b) load carrying capacity of pile, c) determining earth pressure and stability of structures.

## **UNIT I SITE INVESTIGATION & SELECTION OF FOUNDATION**

Scope and Objectives – Methods of exploration - boring – water boring and rotary drilling – Depth of boring – Spacing of bore hole – Sampling – Disturbed and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – Bore log report – Penetration tests (SPT and SCPT) – Types of foundations -selection of foundation based on soil condition.

## **UNIT II SHALLOW FOUNDATION**

Introduction – Location and depth of foundation – codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems – Bearing capacity from insitu tests (SPT, SCPT and PLT) – Allowable bearing pressure, Settlement – Components of settlement – determination of settlement of foundations on granular and clay deposits-equal settlement - differential settlement – allowable settlements – Codal provision – Methods of minimizing settlement.

## **UNIT III FOOTINGS AND RAFTS**

Types of foundation – Contact pressure distribution below footings & raft – Isolated and combined footings – types – proportioning – mat foundation- types – uses –proportioning – floating foundation

## **UNIT IV PILES**

Types of piles and their function - Factors influencing the selection of pile – Load Carrying capacity of single pile in granular and cohesive soil – Static formula – dynamic formulae (Engineering news and Hiley's) – capacity from insitu tests (SPT & SCPT) – Negative skin friction – uplift capacity – Group capacity by different methods (Feld's rule, converse Labarra formula and block failure criterion) – Settlement of pile groups –Interpretation of pile load test – Forces on pile caps – under reamed piles – capacity under compression and uplift.

## **UNIT V        RETAINING WALLS**

Plastic equilibrium in soils – active and passive states – Rankine’s cohesionless and cohesive soil – Coloumbo’s wedge theory – condition for critical failure plane – Earth pressure on retaining walls of simple configurations – Graphical methods (Rebhann and Culmann) – pressure on the wall due to line load Stability of retaining walls.

### **TEXT BOOKS:**

1. Punmia, B.C, “Soil Mechanics and foundations” Laximi publication pvt.Ltd., New Delhi, 2005.
2. Gopal Ranjan and Rao, A.S.R. “Basic and Applied Soil Mechanics”, Wiley Eastern Ltd., New Delhi (India), 2003.

### **REFERENCE BOOKS:**

1. Varghese P.C., "Foundation Engineering", PHI Learning Private Limited, New Delhi, 2005.
2. Das, B.M. "Principles of Foundation Engineering (Fifth Edition), Thomson Books/COLE, 2003
3. Murty, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Lts., New Delhi, 1999.
4. Swamisaran, "Analysis and Design of Structures – Limit state Design", Oxford IBH Publishing Co-Pvt. Ltd., New Delhi, 1998.

## 15BCEU0526 STRUCTURAL ANALYSIS

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### Objectives:

To understand the concept of analysis of indeterminate structures by various classical methods and to study the use of ILD for determinate structure and to learn the concepts of moving loads and its effect on structures and to understand the concept of equivalent UDL and study the reversal of stress under live load

### Specific Objectives of Learning:

On completion of the course, the students will be able to use various classical methods for analysis of indeterminate structures and to determine the effect of support settlements for indeterminate structures and to apply the concepts of ILD and moving loads on determinate structures and to apply the concept of equivalent UDL and to determine the reversal of stresses in trusses using ILD

### UNIT I SLOPE DEFLECTION METHOD

Displacement method concept – Slope deflection equations – Fixed end moments – Application to the analysis of statically indeterminate beams with and without settlement of supports and rigid jointed plane frames with and without side sway – Effect of settlement of supports.

### UNIT II MOMENT DISTRIBUTION METHOD

Basic concepts – Stiffness, distribution and carry over factors – Application to the analysis of propped cantilever continuous beams, rigid jointed plane frames with and without side sway and box culvert – Effect of settlement of supports .

### UNIT III ROLLING LOADS & INFLUENCE LINES

Rolling loads – Description of Influence line (I.L) – I.L for statically determinate beams for reaction, SF & BM due to concentrated and Udl – Effect of rolling loads – Concentrated and uniformly distributed loads – Curves of max. BM & SF diagrams – Load position – Absolute max. BM – Equivalent Udl – I.L. for forces in members of statically determinate parallel chord trusses – Reversal of Stresses under live load.

### UNIT IV KANE'S METHOD

Principle – rotation and translation – contribution factors – analysis of continuous frames without joint translation – symmetrical frames and frames with side sway.

### UNIT V ARCHES

Theory of Arches – Eddy's theorem – Analysis of three hinged and two hinged arches – Parabolic & semi – circular – Determination of reaction, Normal thrust, radial shear & BM – I.L. for stress resultants in two hinged & three hinged arches – Load position for maximum values – Rib shortening.

### TEXT BOOKS:

1. Theory of structures – B.C.Punmia, Ashokkumar Jain & Arunkumar Jain, Laxmi Publications, New Delhi.
2. Structural Analysis – L.S.Negi & R.S.Jangid, Tata McGraw Hill, New Delhi.

### REFERENCES:

1. Basic structural Analysis – C.S.Reddy, Tata McGraw Hill
2. Analysis of structures – V.N.Vazirani & M.M.Ratwani, Khanna Publishers, Delhi.
3. Indeterminate Structures – R.L.Jindal, .Chand & Company, New Delhi.
4. Theory and Analysis of Structures Vol. II – O.P. Jain & A.S.Arya, NemChand & Bros., Roorkee, U.P.

## **15BCEU0527 DESIGN OF RCC ELEMENTS**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

To study the stress strain behavior of steel and concrete and to understand the concept of working stress and limit state methods and to gain the knowledge of limit state design for flexure, shear, torsion, bond and anchorage and to understand the behavior of columns subjected to eccentric load and use of interaction diagrams and to study the design of various foundation

### **Specific Objectives of Learning:**

On completion of the course, the students will be able to apply the fundamental concepts of working stress method and limit state method and use IS code of practice for the design of concrete elements and designs the beams, slab, column and footing and draws various RCC structural elements

## **UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES**

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 – Design of flexural members and slabs by working stress method – Principles of Design of Liquid retaining structures – Properties of un-cracked section – Calculation of thickness and reinforcement for Liquid retaining structure

## **UNIT II LIMIT STATE DESIGN FOR FLEXURE**

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 LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION**

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

## **UNIT IV LIMIT STATE DESIGN OF COLUMNS**

Types of columns – Braced and unbraced columns – Design of short column for axial, uni axial and biaxial bending – Design of long columns.

## **UNIT V      LIMIT STATE DESIGN OF FOOTING AND DETAILING**

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.

### **TEXT BOOKS:**

1. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi
2. Krishna Raju, N., “Design of Reinforced Concrete Structures”, CBS Publishers & Distributors, New Delhi

### **REFERENCES:**

1. Jain, A.K., “Limit State Design of RC Structures”, Nemchand Publications, Rourkee
2. Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. Unnikrishna Pillai, S., Devadas Menon, “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., New Delhi

## **15BCEU0528 RAILWAYS & AIRPORT ENGINEERING**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

This course imparts the student's knowledge of planning, design, construction and maintenance of railway tracks. The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering. The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics.

### **Specific Objectives of Learning:**

On completion of the course, the students will be able to: carry out the surveys for railways and airports ,perform geometric design for the two modes ,plan the layout of different types of terminals ,apply the principles of bus transit, MRTS and LRT ,demonstrate the fundamentals of Intelligent Transportation Systems

### **UNIT I INTRODUCTION**

Role of Indian Railways in National Development – Railway Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipments) - Train Resistances - Rolling Stock -Locomotives, Coaches, Wagons – Train Brakes.

### **UNIT II RAILWAY PLANNING AND DESIGN**

Permanent Way, its Components and Functions of each Component: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density Ballasts – Functions, Materials, Ballast less Tracks Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves (Derivations of Formulae and Problems)

### **UNIT III RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION**

Points and Crossings - Design of Turnouts, Working Principle Signaling, Interlocking and Track Circuiting Construction & Maintenance – Conventional, Modern methods and Materials, Track Drainage Track Modernisation– Automated maintenance and upgrading, Technologies, Re-laying of Track, Lay outs of Railway Stations and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings

### **UNIT IV AIRPORT PLANNING AND DESIGN**

Advantages and Limitations of Air Transport, Components of Airports Airport Planning – Air traffic potential, Site Selection, Design of Components, Cost Estimates, Evaluation and Institutional arrangements Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways

## **UNIT V      AIRPORT LAYOUTS, VISUAL AIDS & AIR TRAFFIC CONTROL**

Airport Layouts – Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and Circulation Pattern, Case studies of Airport Layouts 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 – Basic Actions, Air Traffic Control Network Helipads, Hangars, Service Equipments.

### **TEXT BOOKS:**

1. Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994.
2. S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.
3. Rangwala, Railway Engineering, Charotar Publishing House, 1995.

### **REFERENCES:**

1. Rangwala, Airport Engineering, Charotar Publishing House, 1996.
2. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 1998.
3. Oza and Oza, “A course in Docks & Harbour Engineering”.
4. J.S. Mundrey, “A course in Railway Track Engineering”.

## 15BCEU0529 WATER SUPPLY ENGINEERING

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### Objectives:

- To make the students conversant with principles of water supply, treatment and distribution.

### Specific Objectives of learning:

The students completing the course will have

- an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
- an understanding of water quality criteria and standards, and their relation to public health the ability to design and evaluate water supply project alternatives on basis of chosen selection criteria

### UNIT I PLANNING FOR WATER SUPPLY SYSTEM

Public water supply system -Planning - Objectives -Design period - Population forecasting -Water demand -Sources of water and their characteristics -Surface and Groundwater- Impounding Reservoir Well hydraulics -Development and selection of source - Water quality - Characterization and standards- Impact of climate change.

### UNIT II CONVEYANCE SYSTEM

Water supply -intake structures -Functions and drawings -Pipes and conduits for water- Pipe materials - Hydraulics of flow in pipes -Transmission main design -Laying, jointing and testing of pipes - Drawings appurtenances - Types and capacity of pumps -Selection of pumps and pipe materials.

### UNIT III WATER TREATMENT

Objectives - Unit operations and processes - Principles, functions design and drawing of Chemical feeding, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection- Residue Management - Construction and Operation & Maintenance aspects of Water Treatment Plants.

### UNIT IV ADVANCEDWATERTREATMENT

Principles and functions of Aeration - Iron and manganese removal, Defluoridation and demineralization -Water softening - Desalination - Membrane Systems - Recent advances.

### UNIT V WATERDISTRIBUTIONANDSUPPLYTOBUILDINGS

Requirements of water distribution -Components -Service reservoirs -Functions and drawings -Network design -Economics -Computer applications -Analysis of distribution networks -Appurtenances -operation and maintenance -Leak detection, Methods. Principles of design of water supply in buildings -House service connection -Fixtures and fittings -Systems of plumbing and drawings of types of plumbing.

### TEXT BOOKS:

1. Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.
2. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.
3. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2005

### REFERENCES:

1. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
2. Syed R. Qasim and Edward M. Motley Guang Zhu, "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

## **15BCEU0530 CONSTRUCTION MANAGEMENT**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

- To know about the basics and importance of construction management and cash flow concepts.

### **Specific Objectives of learning:**

- To study about the construction contract documents.
- To impart the idea about planning and scheduling of activities and scheduling softwares.
- To introduce the concepts of resource planning and allocation and control.
- To study about the Quality and safety in construction sites.

## **UNIT I PRINCIPLE OF MANAGEMENT**

Definition –Importance-Function of management-relevance to Government and quasi – Government departments- private contractors and contracting firms- organizational structure.

## **UNIT II CIVIL ENGINEERING MANAGEMENT**

CONSTRUCTION PLANNING: collection of field data – preliminary estimates – Approval and sanction of estimates- Budget provisions-construction stages- scheduling methods- progress reports and charts.

RESOURCE PLANNING; planning for materials, machines and organization- resource allocation

LABOUR AND LABOUR WELFARE;; Relationship between management and labour – problems- labour legislations – Minimum wages act – Settlement of disputes – Industrial psychology.

## **UNIT III MANAGEMENT METHODS**

Concepts of network – Network planning methods – CPM/PERT – Management by network analysis and control – Principles of cost control – Control by Graphical representation, by bill of quantities and by network analysis.

## **UNIT IV EXECUTION OF WORKS**

DEPARTMENTAL WORKS: Procedure – Departmental labour – Quality control, Inspection and duties of personnel – Safety requirements.

CONTRACTS: Contract system – Types of contracts – Specifications, documents, procedures, condition, and taxes, Law of contractors and legal implications and penalties.

TENDER AND TENDER DOCUMENTS: Definition – calling for tenders, Tender, Documents – Submission of tenders – Processing of tenders – Negotiations and settlement of contracts.

## **UNIT V        ACCOUNTS AND STORES**

Measurement of work as per ISI 200 – Recording checking – types of bills –Mode of payment – Budget estimate – revised estimate – Completion reports and certificates – Claims – banking settlement – types of accounts – Drawl and transfer classifications of transactions – Ledger accounts – Impress account – Cash book. Suspense Classification – Storing – Maintenance Inspection – Inventories – Transfer of surplus and accounting of shortage stores – Procedures adopted in PWD and CPWD.

### **TEXT BOOKS**

1. Construction Management – Sanga Reddy & Meyyappan, Kumaran Pub.
2. Essentials of Management – Joshph L.Massie, Prentice Hall of India.
3. Construction Management- Cholt and Dhir
4. Construction Management & Planning – B.Sen Gupta & H.Guhr, Tata McGraw Hill.

### **REFERENCES:**

1. C.P.W.D. Manuals
2. Public works Accounts code, P.W.D , TAMILNADU

Construction Project Management – K.K.Chitkara, Tata McGraw Hill

## **15BCEU0531 ESTIMATION, COSTING AND VALUATION**

C : 2, L : 1, T : 0, P : 2, CFA: 60, ESE: 40

### **Objectives:**

- To understand the fundamentals of estimation and specification
- To provide exposure to rate analysis
- To provide hands on experience on estimation
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### **UNIT I ESTIMATE OF BUILDINGS**

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

### **UNIT II ESTIMATE OF OTHER STRUCTURES**

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

### **UNIT III SPECIFICATION AND TENDERS**

Data – Schedule of rates – Analysis of rates – Specifications – sources – Preparation of detailed and general specifications – Tenders – TTT Act – e-tender – Preparation of Tender Notice and Document – Contracts – Types of contracts – Drafting of contract documents – Arbitration and legal requirements.

### **UNIT IV VALUATION**

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease

### **UNIT V REPORT PREPARATION**

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

### **TEXTBOOKS:**

1. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2003
2. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & Company Ltd., 2004

### **REFERENCES:**

1. PWD Data Book.
2. Tamilnadu Transparencies in Tender Act, 1998
3. Arbitration and Conciliation Act, 1996
4. Standard Bid Evaluation Form, Procurement of Goods or Works, The World Bank, April 1996.

## **15BCEU0532 CONCRETE AND HIGHWAY ENGINEERING LABORATORY**

C : 2, L : 0, T : 0, P : 3, CFA: 60, ESE: 40

### **Objectives:**

**To learn the principles and procedures of testing Concrete and Highway materials**

On completion of the course the students are able to

- Assess the quality of the concrete through laboratory tests.
- Assess the durability properties of concrete
- Design the mix proportion for the required concrete strength
- Assess the quality of bitumen through laboratory tests.

### **UNIT I TESTS ON FRESH CONCRETE**

1. Slump cone test
2. Flow table
3. Compaction factor
4. Vee bee test.

### **UNIT II TESTS ON HARDENED CONCRETE**

1. Compressive strength - Cube & Cylinder
2. Flexure test
3. Modulus of Elasticity

### **UNIT III TESTS ON BITUMEN**

1. Penetration
2. Softening Point
3. Ductility
4. Viscosity
5. Elastic Recovery
6. Storage Stability

### **UNIT IV TESTS ON AGGREGATES**

1. Stripping
2. Soundness
3. Proportioning of Aggregates
4. Water Absorption

### **UNIT V TESTS ON BITUMINOUS MIXES**

1. Determination of Binder Content
2. Marshall Stability and Flow values
3. Specific Gravity
4. Density.

**SEMESTER VI**  
**15BCEU0633 DESIGN OF REINFORCED CONCRETE & BRICK MASONRY**  
**STRUCTURES**

C : 3, L : 3, T : 1, P : 0, CFA: 40, ESE: 60

**Objectives:**

To understand the design concept of various structures and detailing of reinforcements and to understand the design of underground and elevated liquid retaining structures

**Specific Objectives of Learning:**

On completion of the course, the students will be able to apply the concepts of retaining structures and brick masonry structures

**UNIT I RETAINING WALLS**

Introduction- types of retaining walls- Rankines theory of active earth pressure- passive earth pressure- Stability of cantilever retaining wall-Design detailing of cantilever and counter fort RCC retaining walls.

**UNIT II WATER TANKS**

Types of water tanks- Underground rectangular tanks – introduction –Domes– Overhead circular and rectangular tanks– Design of staging and foundations- Design as per BIS Codal Provisions.

**UNIT III SELECTED TOPICS**

Types of staircases-Design of staircases (ordinary and doglegged) – introduction – components of flat slab construction-Design of flat slabs – Design of Reinforced concrete walls –types of foundation- Principles of design of mat foundation

**UNIT IV YIELD LINE THEORY**

Introduction- Characteristics of yield line - Application of virtual work method - square, rectangular, circular and triangular slabs - Design problems

**UNIT V BRICK MASONRY**

Introduction, Classification of walls, Lateral supports and stability, effective height of wall and columns, effective length of walls, design loads, load dispersion, permissible stresses, design of axially and eccentrically loaded brick walls

**TEXT BOOKS:**

1. Krishna Raju, N., “Design of RC Structures”, CBS Publishers and Distributors, Delhi.
2. Varghese, P.C., “Limit State Design of Reinforced Concrete Structures”
3. Punmia, P.C., Ashok.K.Jain and Arun.K.Jain. “Reinforced Concrete Structures” Vol III, Laxmi Publications, New Delhi, 2000

**REFERENCES:**

1. Mallick, D.K. and Gupta A.P., “Reinforced Concrete”, Oxford and IBH Publishing Company
2. Syal, I.C. and Goel, A.K., “Reinforced Concrete Structures”, A.H. Wheelers & Co., Pvt., Ltd., 1994
3. Ram Chandra, “Limit State Design”, Standard Book House.

## **15BCEU0634 WATER RESOURCE & IRRIGATION ENGINEERING**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

- To know the basics of irrigation and drip, sprinkler and lift irrigation.
- To study the relationship between soil, plant and water.

### **Specific Objectives of Learning:**

- On completion of the course, To learn about importance, location and function of various conveyance and distribution systems like weirs, sluices, barrages, drops, escapes, shutters, To study the water logging problem, salinity, and drainage systems, To learn about irrigation water management on-farm development and command area development.

### **UNIT I WATER RESOURCES**

Water resources survey – Water resources of India and Tamilnadu-Description of water resources planning-Estimation of water requirements for irrigation and drinking-Single and multipurpose reservoir – Multi objective-Fixation of Storage capacity-Strategies for reservoir operation-Design flood-levees and flood walls.

### **UNIT II WATER RESOURCE MANAGEMENT**

Economics of water resources planning-National Water Policy-Consumptive and non-consumptive water use-Water quality-Scope and aims of master plan-Concept of basin as a unit for development-Water budget-Conjunctive use of surface and ground water

### **UNIT III IRRIGATION ENGINEERING**

Need – Merits and Demerits – Duty, Delta and Base period-Irrigation efficiencies-Crops and Seasons-Crop water Requirement-Estimation of Consumptive use of water

### **UNIT IV CANAL IRRIGATION**

Types of impounding structures: Gravity dam-Diversion Head works-Canal drop-Cross drainage works-Canal regulations-Canal outlets-Canal lining-Kennady's and Lacey's Regime theory

### **UNIT V IRRIGATION WATER MANAGEMENT**

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.

#### **TEXT BOOKS:**

1. Asawa, G.L., "Irrigation Engineering", New Age International Publishers
2. Sharma R.K., and Sharma T.K., "Irrigation Engineering", S.Chand and company, New Delhi.
3. Gupta, B.L, & Amir Gupta, "Irrigation Engineering", Sathya Praheshan, New Delhi.

#### **REFERENCES:**

1. Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P) Ltd.,
2. Basak, N.N., "Irrigation Engineering", Tata McGraw – Hill Publishing Co.
3. Garg, S.K., "Irrigation engineering".

## 15BCEU0635 ADVANCED STRUCTURAL ANALYSIS

C : 3, L : 3, T : 1, P : 0, CFA: 40, ESE: 60

- **Objectives:**
- To understand the influence line concepts for indeterminate structures and to understand the methods of analysis of intermediate trusses for external loads and to know the concept and analysis of cable stayed bridge
- **Specific Objectives of Learning:**
- On completion of the course, the students will be able to demonstrate the concepts of qualitative influence line diagram for continuous beams and frames and to apply the methods of indeterminate truss analysis and to analyze cable suspension bridges

### UNIT I INFLUENCE LINE FOR INDETERMINATE STRUCTURES

Influence lines – Maxwell Bett's theorem – Muller Brealau's principle and its application to determinate I.L. for propped cantilever, fixed beams, continuous beams and single bay single storey portals.

### UNIT II SUSPENSION CABLES & BRIDGES

Length of cable – Maximum tension – Types of supports – Forces in towers – Suspension bridges with three and two hinged stiffening girders – Influence lines.

### UNIT III FRAMED STRUCTURES

Analysis of multistory frames for gravity loads and wind loads by approximate methods – Substitute frame for vertical loads – Portal, Cantilever methods & Factor methods for horizontal loads.

### UNIT IV MATRIX FLEXIBILITY METHOD

Formation of flexibility matrices for elements and structures – Choice of redundant 0 flexibility coefficients – Analysis of propped – cantilever, continuous beams, simple rigid jointed frames with redundancy restricted to two.

### UNIT V MATRIX STIFFNESS METHOD

Formation of stiffness matrices for element and structures – Stiffness coefficients – Analysis of propped cantilever, continuous beams, and simple rigid jointed frames (with Kinematic indeterminacy restricted to two)

#### TEXT BOOKS:

1. Theory of structures – B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Lakshmi Publications, New Delhi.
2. Theory and Analysis of Structures Vol.II – O.P. Jain & A.S.Arya, NewChand & Bros, Roorkee, U.P.
3. Elementary matrix analysis of structures – Dr.V.K.Manicka Selvam, Khanna Publishers, New Delhi.
4. Structural Analysis – L.S.Negi & R.S.Jangid, Tata McGraw Hill, New Delhi.

#### REFERENCES:

1. Matrix analysis of framed structures – Jr.William Weaver & James M.Gere, CBS Publishers & Distributors, Delhi.
2. Structural Analysis – A Matrix Approach – G..Pandit & S.P.Gupta, Tata McGraw Hill
3. Analysis of indeterminate structures – G.K.Wang, Tata McGraw Hill
4. Structural Analysis I & II – Bhavikatti, Vikas Publishing House P.Ltd.

## 15BCEU0636 DESIGN OF STEEL STRUCTURES

(Limit State Design as per IS 800-2007)

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

**Objectives:** To study the Sections and properties of steel sections available and design of various building elements (beam, column, foundation, truss, etc.,) by steel sections.

**Specific Objective of Learning:** This course covers the design of structural steel members by Limit state design concepts subjected to compressive, tensile and bending loads, as per current codal provisions of IS 800 – 2007 including connections. Design of structural systems such as roof trusses, gantry girders are included.

### UNIT I INTRODUCTION

Steel Structures – Types - Advantages and disadvantages of steel structures - Properties of steel - material specifications - Rolled steel sections – Built-up sections - Limit State Design Concepts – Loads on Structures Permissible stresses in tension, compression, bending and shear.

### UNIT II BOLTED CONNECTIONS & WELDED CONNECTION

Types of bolts – black bolts – turned and fitted bolts – high strength friction grip bolts – Proof loads – types of bolted connections – design of bolted shear connections – subjected to shear and tension. Welding – welded connection - Types – advantages- defects – butt weld – fillet weld – stresses in welds – design of fillet weld for axial load – design of butt weld – plug and slot weld – eccentrically loaded fillet weld joints – eccentrically loaded butt welded joints.

### UNIT III TENSION MEMBER

Tension members - Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Design of Lug Angle - Design of tension splice.

### UNIT IV COMPRESSION MEMBERS

Compression member - 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 – Design of column bases – Gusseted base.

### UNIT IV BEAMS, ROOF TRUSSES AND INDUSTRIAL STRUCTURES

Beam – Types - Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders bolted and welded – stiffeners – Types- Beam Column. Roof trusses – Components - Roof and side coverings – loads on trusses, Design of purlin – gantry girder- components- types- design criteria.

#### TEXT BOOK:

1. Duggal.S.K, Limit state design of Steel structures, Tata McGraw Hill education private limited, New Delhi, 2010

#### REFERENCES:

1. Bhavikatti,S.S,Design of Steel Structures, I.K International Publishing House Pvt,Ltd ,New Delhi,2009
2. Subramanian,N. Design of Steel Structures, Oxford University Press, New Delhi,2008.
3. Duggal.S.K, Design of Steel structures, Tata McGraw Hill education private limited, New Delhi, 2010.

## **15BCEU0637 WASTE WATER ENGINEERING**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

- To educate the students on the principles and design of Sewage Collection, Conveyance, treatment and disposal

### **Specific Objectives of learning:**

The students completing the course will have

- ability to estimate sewage generation and design sewer system including sewage pumping stations
- required understanding on the characteristics and composition of sewage, self purification of streams
- ability to perform basic design of the unit operations and processes that are used in sewage treatment

### **UNIT I PLANNING FOR SEWERAGE SYSTEMS**

Sources of wastewater generation – Effects – Estimation of sanitary sewage flow – Estimation of storm runoff – Factors affecting Characteristics and composition of sewage and their significance – Effluent standards – Legislation requirements.

### **UNIT II SEWER DESIGN**

Sewerage – Hydraulics of flow in sewers – Objectives – Design period - Design of sanitary and storm sewers – Small bore systems - Computer applications – Laying, joining & testing of sewers – appurtenances – Pumps – selection of pumps and pipe Drainage -. Plumbing System for Buildings – One pipe and two pipe system.

### **UNIT III PRIMARY TREATMENT OF SEWAGE**

Objective – Selection of treatment processes – Principles, Functions, Design and Drawing of Units - Onsite sanitation - Septic tank with dispersion - Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Construction, operation and Maintenance aspects.

### **UNIT IV SECONDARY TREATMENT OF SEWAGE**

Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units - Activated Sludge Process and Trickling filter – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage - sewage recycle in residential complex - Recent Advances in Sewage Treatment – Construction and Operation & Maintenance of Sewage Treatment Plants.

## **UNIT V        DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT**

Standards for Disposal - Methods – dilution – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

### **TEXT BOOKS:**

1. Garg, S.K., "Environmental Engineering" Vol. II, Khanna Publishers, New Delhi, 2003.
2. Punmia, B.C., Jain, A.K., and Jain. A., "Environmental Engineering", Vol.II, Lakshmi Publications, New Delhi, 2005.

### **REFERENCES:**

1. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1997.
2. Metcalf & Eddy, "Wastewater Engineering" – Treatment and Reuse, Tata McGraw Hill Company, New Delhi, 2003.
3. Karia G L & Christian R A, "Wastewater Treatment", Prentice Hall of India, New Delhi, 2013.

## 15CHEU06C3 ENVIROMENTAL ENGINEERING LABORATORY

C : 2, L : 0, T : 0, P : 3, CFA: 60, ESE: 40

**Objectives:** The objective of the practical course is to enhance practical knowledge in basic principles of environmental engineering, to develop skill in estimation of water quality parameters.

**Specific objective of learning outcomes:** After successful completion of the course, students will be able to

- Determine total alkalinity and total hardness of water
- Detrmine the pH of water and sand
- Determine total dissolved solid and total suspended solids, BOD, COD in water
- Measure electrical conductivity of water

### List of Exercises

1. Determination of total alkalinity of water.
2. Detarmination of (i) pH of water (ii) pH of sand
3. Determination of (i) Total solids (ii) Total Dissolved solids (iii) Total Suspended solids.
4. Determination of Electrical conductivity of water
5. Estimation of total hardness of water.
6. Estimation of ferrous Iron.
7. Estimation of Sulphate.
8. Estimation of available chlorine in bleaching powder.
9. Estimation of Chloride.
10. Determination of (i) BOD (ii) COD.

### REFERENCES

1. V. Venkateshwaran, R. Veeraswamy, A. R. Kulandaivelu, Basic Principles of Practical Chemistry, 2<sup>nd</sup> Edition, Sultan Chand & Sons, 1997.
2. B.Kotaiah, N. Kumaraswamy, Environmental Enginneering Laboratory Manual, Charotar Publishing House P vt. Ltd., New Delhi 2007.

## **15BCEU0638 IRRIGATION & ENVIRONMENTAL ENGINEERING DRAWING**

### **(Design and Drawing)**

C : 2, L : 1, T : 0, P : 2, CFA: 60, ESE: 40

#### **IRRIGATION ENGINEERING DRAWING**

1. Tank surplus weir
2. Tank sluice with tower head
3. Canal drop(Notch Type)
4. Canal regulator
5. Siphon aqueduct

#### **ENVIRONMENTAL ENGINEERING DRAWING**

1. General layout of water and waste treatment plants
2. Sedimentation aided with coagulation
3. Slow sand filter
4. Rapid sand filter
5. Trickling filter
6. Septic tank

#### **TEXT BOOKS:**

1. Garg, S.K, “Irrigation Engineering and Design of Structures”
2. Satyanarayana Murthy, “Irrigation Design and Drawing”, Published by Mrs. L.Banumathi, Tuni, East Godavari District, A.P. 1998
3. Sharma R.K, “Irrigation Engineering and Hydraulic Structures”, Oxford and IBH Publishing Co., New Delhi, 2002.

#### **REFERENCES:**

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
2. Manual of Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993
3. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987
4. Peary, H.S., Rowe, D.R., and Tchobanoglous, G., “Environmental Engineering”, McGraw-Hill Book Co., New Delhi, 1995
5. Metcalf & Eddy, “Wastewater Engineering (Treatment and Reuse)”, 4th Edition, Tata McGraw-Hill, New Delhi, 2003

### **15BCEU0639 DESIGN PROJECT**

C : 3, L : 0, T : 0, P : 3 , CFA: 60, ESE: 40

#### **Objectives:**

To carry out a project which will make the students aware of the different facets of civil engineering design of structures.

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### **15BCEU0640 SUMMER INTERNSHIP**

C : 2, L : 0, T : 0, P : 0, CFA: 100, ESE: 0

1. Any structure design software training programme for a period of 90 hrs.
2. Field placement in the construction site / design infrastructure / for a period of one month.
3. A detailed project report to be submitted for evaluation.

**SEMESTER VII**  
**15BCEU0741 PRE-STRESSED CONCRETE STRUCTURES**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

**Objectives:**

To learn the principles, materials, methods and systems of prestressing and to know the different types of losses and deflection of prestressed members and to learn the design of prestressed concrete beams for flexural, shear and tension and to calculate ultimate flexural strength of beam and to learn the design of anchorage zones, composite beams, analysis and design of continuous beam

**Specific Objectives of Learning:**

On completion of the course, the students will be able to design a prestressed concrete beam accounting for losses and to design the anchorage zone for post tensioned members and to design composite members and to design continuous beams

**UNIT I INTRODUCTION TO PRE-STRESSING**

General Principles – Classification and type – Materials – Prestressing systems – Loss of prestress – Analysis of section for flexure.

**UNIT II DESIGN OF BEAMS**

Design of beams: Design of section for flexure – general approach for service load design – Ultimate design for limit state of collapse – Provision of IS code. Design for shear: General theory – Elastic theory – Ultimate limit state – Provision of IS code – Deflection – Beam deflection – Short term and long term deflections – Provision in IS code.

**UNIT III ANCHORAGE TENSION & COMPRESSION MEMBERS**

Design of Anchorage: Stress distribution in end block – Design of end block – IS code provision. Design of compression and tension members: Tension member elastic design – Tension member cracking and ultimate strength – Compression members – Design.

**UNIT IV CONTINUOUS BEAM & CIRCULAR PRE-STRESSING**

Design of continuous beams: Advantages of continuity – Effect of prestressing – Analysis of continuous beams – Linear transformation and concordance of cables – Design of continuous beam. Circular prestressing : Method and applications circumferential prestressing – Design of prestress concrete pipes and tanks.

**UNIT V COMPOSITE SECTIONS**

Composite sections – Types of composite construction flexural analysis – Design of composite section – Shrinkage stresses in composite section.

**TEXT BOOKS:**

1. Pre-Stressed Concrete 3/e, N.Krishna Raju, Tata McGraw Hill, New Delhi.
2. Fundamental of Pre-stressed concrete –N.C.Sinha and S.K.Roy, S.Chand Company Ltd, New Delhi.

**REFERENCES:**

1. Design of pre-stressed concrete structures – T.Y.Lin, Asia Publishing House, New Delhi.
2. Modern Pre-stress Concrete – Libby, R.James, Van Nostrand, New York
3. Pre-stress Concrete Structures – P.Dayarathnam, Oxford & IBH Publishers BIS 1343.

## **15BCEU0742 SOLID WASTE MANAGEMENT**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

To make the students conversant with different aspects of the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

### **Specific Objectives of Learning:**

The students completing the course will have an understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management and ability to plan waste minimization and design storage, collection, transport, processing and disposal of municipal solid waste

### **UNIT I SOURCES AND TYPES**

Sources and types of solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – integrated management-Public awareness; Role of NGO's.

### **UNIT II ON-SITE STORAGE AND PROCESSING**

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling.

### **UNIT III COLLECTION AND TRANSFER**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

### **UNIT IV OFF-SITE PROCESSING**

Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

### **UNIT V DISPOSAL**

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation.

### **TEXTBOOKS:**

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues". McGraw Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981
3. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000

### **REFERENCES:**

1. Government of India, "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001
3. Manser A.G.R. and Keeling A.A., " Practical Handbook of Processing and Recycling of Municipal solid Wastes", Lewis Publishers, CRC Press, 1996
4. George Tchobanoglous and Frank Kreith "Handbook of Solidwaste Management", McGraw Hill, New York, 2002

## **15BCEU0743 FUNDAMENTALS OF RS & GIS**

C : 3, L : 2, T : 0, P : 2, CFA: 40, ESE: 60

### **Objectives:**

- To study the basic principles of remote sensing and GIS ,To study the characteristics of the instrument used for remote sensing

### **Specific Objectives of learning:**

- After completion of course, to understand the GIS, background, development and components of GIS, To understand the Basic concepts of remote sensing ,To understand the different areas of applications of Remote sensing

### **UNIT I FUNDAMENTALS OF REMOTE SENSING**

Physics of remote sensing – Energy sources – Radiation Principles – Black Body Radiation – Plank's Law – Stefan – Boltzman law – Energy interaction with atmosphere – Atmospheric characteristics – Scattering – Raleigh, Mie, Non-selective and Raman scattering – Absorption – Atmospheric Windows and its significance – Energy interaction with earth surface features – Absorption, Transmission, scattering, Radiance, Irradiance, Incident & Reflection, EMR interaction with ozone, water vapour, water, soil, vegetation and rock.

### **UNIT II DATA ACQUISITION**

Spectral reflectance of earth surface features in different wave length regions of EMR – Visible, Infra Red (IR), near IR, Middle IR, and Thermal IR.- Spectral Signature – Spectral Signature Curves. Satellites – Classification – based on orbit and purpose – Sensors-Resolutions (Spectral, Spatial, Temporal and Radiometric) of IRS series, LANDSAT, SPOT, IKONOS AND ERS satellites – Description of Sensors in IRS series, LANDSAT, SPOT, IKONOS AND ERS satellites – description of multispectral scanning – data acquisition (Signal detection, Recording and Scanning Mechanism)

### **UNIT III DATA ANALYSIS**

Image interpretation elements – Visual interpretation of satellite images – interpretation key characteristics of digital satellite image – digital Image Processing – Stretching – Filtering – Edge Enhancement – Band Rationing – Image Classification.

### **UNIT IV GEOGRAPHICAL INFORMATION SYSTEMS**

Definition – Components – Hardware and software – Data structures in GIS – Raster and vector data structures – Types of Data – Spatial and Non spatial – Data base structures – Data input and output – Analysis using vector and raster data – Retrieval, Reclassification, Overlaying and Buffering – Maps – Types of maps – projection- types of projection

### **UNIT V APPLICATION OF REMOTE SENSING AND GIS**

Introduction to GPS and its applications – Integration of Remote Sensing and GIS – Hydrological & Water resources assessment and mapping – Soil and Geological mapping – Land use and Land cover mapping – Environmental assessment and Planning – Urban sprawl mapping and Transportation studies.

**TEXT BOOKS:**

1. Anji Reddi, Remote Sensing and Geographical Information Systems, BS publications, 2001
2. Lillesand T.M. and Kiefer W, “Remote Sensing and Image Interpretations” John Wiley & Sons, New York.

**REFERENCES:**

1. Prithvish Nag and M.Kudrat, “Digital Remote Sensing”, Concept Publishing Company, New Delhi, 1998.
  2. John R. Jensen, “Remote Sensing of the environment – An Earth resource perspective, “ Pearson Education Publication (Singapore – low prized ed.,) Indian branch, Delhi 2005
  3. 1987Srinivas M.G. (Edited by) Remote Sensing Applications, Narosa Publishing House 2001
  4. Burrough, P.A. “ Principles of Geographical Information systems for Land resources assessment” Clarandone Press, Oxford, 1986
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**15BCEU0744 BASICS OF DYNAMICS AND ASESISMIC DESIGN**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

**Objectives:**

The main objective of this course is to introduce to the student the phenomena of earthquakes, the process, measurements and the factors that affect the design of structures in seismic areas. This objective is achieved through imparting rudiments of theory of vibrations necessary to understand and analyse the dynamic forces caused by earthquakes and structures. Further, the student is also taught the codal provisions as well as the aseismic design methodology and to introduce the concepts of dynamic systems and to study the dynamic response of SDOF and MDOF

**Specific Objectives of Learning:**

On completion of the course, the students will be able to apply the concepts of dynamic systems and to identify, formulate and solve dynamic response of SDOF and MDOF and to analyze continuous systems subjected to different types of dynamic loads and to identify, formulate and solve free and forced vibrations response of structural systems

**UNIT I THEORY OF VIBRATIONS**

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**

Two degree of freedom system – Normal modes of vibration – Natural frequencies – Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations).

## **UNIT III      ELEMENTS OF SEISMOLOGY**

Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound – Epicentre – Hypocentre – Primary, shear and Raleigh 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**

Response and design spectra – Design earthquake – concept of peak acceleration – Site specific response spectrum – Effect of soil properties and damping – Liquefaction of soils – Importance of ductility – Methods of introducing ductility into RC structures.

## **UNIT V      DESIGN METHODOLOGY**

IS 1893, IS 13920 and IS 4326 – Codal provisions – Design as per the codes – Base isolation techniques – Vibration control measures – Important points in mitigating effects of earthquake on structures.

### **TEXT BOOK:**

1. Chopra, A.K., “Dynamics of Structures – Theory and Applications to Earthquake Engineering”, Second Edition, Pearson Education, 2003.

### **REFERENCES:**

1. Biggs, J.M., “Introduction to Structural Dynamics”, McGraw–Hill Book Co., N.Y., 1964
2. Dowrick, D.J., “Earthquake Resistant Design”, John Wiley & Sons, London, 1977
3. Paz, M., “Structural Dynamics – Theory & Computation”, CSB Publishers & Distributors, Shahdara, Delhi, 1985

**15BCEU07EX MAJOR ELECTIVE I**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

**15BCEU07MX MODULAR COURSE I**

C: 2, L : 0, T : 0, P : 0, CFA: 50, ESE: -

**15BCEU0745 TECHNICAL SEMINAR**

C : 2, L : 0, T : 0, P : 3, CFA: 100, ESE: 0

## **15BCEU0746 COMPUTER AIDED DESIGN AND DRAFTING LABORATORY**

C : 2, L : 1, T : 0, P : 2, CFA: 60, ESE: 40

Simple exercise using any one from each part

Part A: STAAD.PRO/NISA/STARDYNE/ANSYS

Part B: 3D ARCHITECT/3D HOME/AUTO CIVIL/ SCADSS

### **Objectives:**

To make the student to design the Concrete and steel structural elements and structures by the application of design softwares.

### **Specific Objectives of Learning:**

At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

### **SUGGESTED TOPICS:**

1. Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details
2. Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details
3. Design of pressed, rectangular and hemispherical bottomed steel tank – Staging – Detailed drawings
4. Design and drafting of Into type water tank, Detailing of circular and rectangular water tanks
5. Design of plate girder bridge – Twin Girder deck type Railway Bridge – Truss Girder bridges – Detailed Drawings including connections.

### **TEXT BOOKS:**

1. Krishna Raju, “Structural Design & Drawing (Concrete & Steel)”, CBS Publishers
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, “Design of steel structures”, Lakshmi publications Pvt. Ltd.
3. Civil Engineering Drawing & House Planning – B.P. Verma, Khanna Publishers, Delhi.
4. Building Drawing & Detailing – Dr. Bala Gopal & T.S.Prabhu, Spades Publishers, Calicut

### **REFERENCES:**

1. Krishnamurthy, D., “Structural Design & Drawing – Vol. II”, CBS Publishers & Distributors, New Delhi
2. Krishnamurthy, D., “Structural Design & Drawing – Vol. III Steel Structures”, CBS Publishers & Distributors, New Delhi

## **SEMESTER VIII**

### **15BCEU0847 COST EFFECTIVE CONSTRUCTION TECHNOLOGY**

C : 3, L : 2, T : 0, P : 2, CFA: 40, ESE: 60

#### **UNIT I**

Mud Technology- salient features of SMB – Selection of soil Determination of compressive stress – water retention test – consistency test – cohesion test – observation choice of stabilizer – block making – mould size – Economics of burnt bricks and SMB – suitability of soil for stabilizer – method of construction using mud blocks – water proof coating and plasters – improve earth structures – quality control.

#### **UNIT II**

Pre cast stone block – Introduction – method of production – types of moulds – selection of materials – casting blocks – physical properties – compressive strength of stone masonry blocks – water absorption – cost economic – hollow concrete blocks introduction – advantages of hollow concrete blocks – masonry precaution – economic method of production – mix ratio curing stocking transportation – compressive strength manufacturing machineries.

#### **UNIT III**

Pre cast roof and floor system: Pre cast reinforced concrete L – pans for roof – interlocation – materials – Element for roof supporting beam method of casting curing erection pre cast RC plank flooring preparation method of pre cast RCC joist moulds cast and curing precaution during casting and placing Economics funicular shell micro concrete tiles method of manufacturing support beam erection.

#### **UNIT IV**

Pre cast Brick panel roofing system – manufacturing method of Brick panel – suitable joist curved brick panel method of laying roof fly ash bricks manufacturing methods.

#### **UNIT V**

Ferrocement – introduction advantages manufacturing process mud mould construction – casting procedure for roof channel curing stocking fabrication and specification of ferrocement doors – manufacturing method of Ferrocement products – innovation painting installation and maintenance manufacturing methods of small capacity Ferrocement water tanks economics.

#### **REFERENCES:**

1. Reading materials capacity Building for project managers of Building Centre Vol. II (Hudson Manual)
2. CBRI Research publication.
3. Low cost housing in Developing countries G.C.Mathur
4. Low cost housing – A.G. Mathava Rao, SERC.

**15BCEU08EX**

**MAJOR ELECTIVE II**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

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**15CEU08MX**

**MODULAR COURSE II**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: -

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**15BCEU0848**

**PROJECT**

C : 6, L : 0, T : 0, P : 12, CFA: 75, ESE: 125

**Objectives:**

To guide the students such a way that they carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations. The project work so chosen by the student shall culminate in gaining of major design experience in the related area of specialization.

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**MAJOR ELECTIVE I**  
**15BCEU07E1 HYDROLOGY**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

**Objectives:**

To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology.

**Specific Objectives of Learning:**

At the end of the semester, the student shall be having a good understanding of all the components of the hydrological cycle. The mechanics of rainfall, its spatial and temporal measurement and their applications will be understood. Simple statistical analysis and application of probability distribution of rainfall and run off shall also be understood. Student will also learn simple methods of flood routing and ground water hydrology.

**UNIT I        PRECIPITATION**

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**

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

**UNIT III        HYDROGRAPHS**

Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

**UNIT IV        FLOODS AND FLOOD ROUTING**

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

**UNIT V        GROUND WATER HYDROLOGY**

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

**TEXTBOOKS:**

1. Subramanya, K., "Engineering Hydrology", Tata McGraw Hill Publishing Co., Ltd., 2000
2. Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000
3. Jayarami Reddy .P. Hydrology, Tata McGraw Hill, 2008.
4. Madan Mohan das and Mimi Das Saikia, Hydrology, Prentice Hall of India, 2013.

**REFERENCES:**

1. Chow, V.T. and Maidment D.R. , "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., "Hydrology", McGraw Hill Inc., Ltd., 2000.

## **15BCEU07E2 TRAFFIC ENGINEERING AND MANAGEMENT**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

### **UNIT I TRAFFIC PLANNING AND CHARACTERISTICS**

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.

### **UNIT II TRAFFIC SURVEYS**

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including non-motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.

### **UNIT III TRAFFIC DESIGN AND VISUAL AIDS**

Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation - Traffic signs including VMS and road markings – Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.

### **UNIT IV TRAFFIC SAFETY AND ENVIRONMENT**

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport.

### **UNIT V TRAFFIC MANAGEMENT**

Area Traffic Management System - Traffic System Management (TSM) with IRC standards — Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

**TEXTBOOKS:**

1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
3. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd.1996.

**REFERENCES:**

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesley Publishing Company, 1996

## **15BCEU07E3 EARTH QUAKE ENGINEERING**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

To provide an understanding of the earthquake hazard, analysis of structures subject to earthquake-induced loads and evaluation of a range of design techniques (including equivalent static analysis, response spectra, capacity design and pushover analysis) and their implementation in practice, including introduction to earthquake design codes (such as IBC and EC8) and ductile detailing practice for reinforced concrete buildings in earthquake zones. An overview of advanced seismic protection systems is also provided.

### **UNIT I**

Introduction-seismic waves-earthquake magnitude,intensity of earthquake,epicenter-plate tectonics-seismic prone regions-seismic energy-characteristics of strong earthquake ground motion-masonry building-remedial measures

### **UNIT II**

Dynamic loads-dynamic influences-response of a structure-single degree freedom system- free and forced vibration(damped and undamped). Multi degree of freedom system

### **UNIT III**

New mark &hall method – concept of response spectrum- elastic response spectrum-inelastic response spectrum- concept of earthquake resistant design- building forms for earthquake resistance code provisionfor design and RC buildings as per code provisions-seismic coefficient method and dynamic analysis- stresses in masonry

### **UNIT IV**

Ductile detailing of reinforced concrete beams – columns – shear wall-detailing in column beam joint- torsion provisions – centre of stiffness- centre of mass- seismic forces on cantilever

### **UNIT V**

Principle of seismic instruments- cathode ray oscilloscope- XY plotter-strip chart recorder- inductive transducer-transducers for velocity and acceleration measurements-displacement transducerLVDT-vibratory sensor

**TEXT BOOKS:**

1. Anil k chopra,"dynamics of structures-theory & applications to earthquake engineering",prentice hall of India,pvt.ltd.,new delhi 1996
2. Kameshwara Rao.N.S.V.,,"vibration and analysis and foundation dynamics",Wheeler publishers, New Delhi,1998
3. Ray N Glough, Joseph Penzein,"Dynamics of Structures",Mc Graw Hill International Ltd,1996

**REFERENCES:**

1. Verma B.P, "Rock mechanics for Engineers",khanna Publishers, New Delhi,1997
2. Jaikrishna & Chandrashekar.A.R , "Elements of earthquake engineering ",Saritha Prakashan , Meerut,1996
3. Bootb,Edmund,"Concrete Structures in earthquake regions;Design and Analysis" Longman, 1994
4. Dowrick, D.J," Eathquake resistant design for Engineers and Architects", John Wiley & Sons , Second Edition 1987

**IS CODES:**

1. IS:1893-2002"C riteria for Earthquake Resistant Designs of Structures".
2. IS:13920,"Code of Oractice for Ductile Detailing of Reinforce Concrete Structures subjected to sesmic forces".
3. IS:13935-1993,"Repair and Sesmic Strengthening of Buildings

## **15BCEU07E4 ADVANCED STORAGE STRUCTURES**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

The main objective of this course is to impart the principles involved in designing structures which have to store different types of materials. The student at the end of the course shall be able to design concrete and steel material retaining structures.

### **UNIT I STEEL WATER TANKS**

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**

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**

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**

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**

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

### **TEXT BOOKS:**

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

## **15BCEU07E5 FINITE ELEMENT TECHNIQUES**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

To understand the general steps of finite element methods. - Understand the basic finite element formulation techniques. - Be able to derive equations in finite element methods for 1D, 2D and 3D problems. - Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics. - Be able to write computer program based on finite element methods. - Be able to use Comsol, a commercial software, to solve basic engineering problems in heat transfer, solid mechanics and fluid mechanics.

### **UNIT I INTRODUCTION – VARIATIONAL FORMULATION**

General Field problems in Engineering – Modeling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functional – Variation calculus Variation formulation of VBPS. The method of weighted residuals – The Ritz method.

### **UNIT II FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS**

One dimensional second order equations – discretisation of domain into elements – Generalized coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

### **UNIT III FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS**

Second order equation involving a scalar-valued function – model equation – Variation formulation – Finite element formulation through generalized coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices – boundary conditions – solution techniques.

### **UNIT IV ISOPARAMETRIC ELEMENTS AND FORMULATION**

Natural coordinates in 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoperimetric elements in 1, 2 and 3 dimensional Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

## **UNIT V      APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS**

Equations of elasticity – plane elasticity problems – ax symmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow

### **TEXT BOOK:**

1. Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, Third Edition, Prentice Hall, India, 2003.

### **REFERENCES:**

1. J.N.Reddy, “An Introduction to Finite Element Method”, McGraw-Hill, Intl. Student Edition, 1985.
2. Zienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4/e, McGraw-Hill, Book Co.
3. S.S.Rao, “The Finite Element Method in Engineering”, Pergaman Press, 2003.
4. C.S.Desai and J.F.Abel, “

**MAJOR ELECTIVE II**  
**15BCEU08E1 REPAIR AND REHABILITATION OF STRUCTURES**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

**Objectives:** To make the students to gain the knowledge on Assess the quality of concrete, and study the durability aspects, causes of deterioration, assessment criteria for damaged structures, repairing of structures and demolition procedures.

**Specific Objectives of learning:** Students must gained knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

**UNIT I        MAINTENANCE AND REPAIR STRATEGIES**

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        STRENGTH AND DURABILITY OF CONCRETE**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

**UNIT III       SPECIAL CONCRETES**

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self-compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

**UNIT IV        TECHNIQUES FOR REPAIR AND PROTECTION METHODS**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, Cathodic protection.

**UNIT V        REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES**

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques - Engineered demolition methods - Case studies.

**TEXT BOOKS:**

1. Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

**REFERENCES:**

1. Shetty M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008.
2. Dov Kominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001
3. Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.96
4. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
5. Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013

## **15BCEU08E2 SMART STRUCTURES AND SMART MATERIALS**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

The Objectives are to provide students with:

- the fundamentals of smart materials, devices and electronics, in particular those related to the development of smart structures and products; and
- the skills, knowledge and motivation in the design, analysis and manufacturing of smart structures and products.

### **UNIT I INTRODUCTION**

Introduction to Smart Materials and Structures – Instrumented structures functions and Response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation Systems and effectors.

### **UNIT II MEASURING TECHNIQUES**

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance– Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

### **UNIT III SENSORS**

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain Measurement – Inductively Read Transducers – The LVDT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

### **UNIT IV ACTUATORS**

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro rheological Fluids–Electromagnetic actuation – Role of actuators and Actuator Materials.

### **UNIT V SIGNAL PROCESSING AND CONTROL SYSTEMS**

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

### **TEXT BOOK:**

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.

### **REFERENCES:**

1. L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 1998.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 1998.

## **15BCEU08E3 BRIDGE ENGINEERING**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

- To study essential of bridge engineering.
- To design RCC slab bridges.
- To design RCC girder bridges.
- To design prestressed concrete slab and girder bridges.
- To design bearings.

### **UNIT I GENERAL**

Introduction – Selection of site for bridge – Linear waterway – Free board – Economical span – Scour depth – Components of a bridge – Types of bridges – IRC Loading Classifications – Specifications for a road bridge – Specifications for railway bridge

### **UNIT II DESIGN OF RCC BRIDGES**

Design of T beam slab bridges for IRC loading – Design of deck slab, longitudinal and cross girders Design of balanced cantilever bridge – Design of slab, main girder, cantilever and articulation

### **UNIT III DESIGN OF STEEL BRIDGES**

Design of through type steel bridge for railway loading – design of stringers, cross girder and main girder Design of deck type steel bridge for railway loading – Design of main girder. Design of plate girder Railway Bridge for railway loading

### **UNIT IV DESIGN OF PRESTRESSED CONCRETE BRIDGES**

Preliminary sections – Flexural and Tensional parameters – Courban's theory – Design of girder section (I section only) – Check for stresses at various sections – Check for diagonal tension – Forces in anchorage zone

### **UNIT V SUBSTRUCTURE AND BEARINGS**

Design principles and construction methods of pier, abutment and Caissons Types of bearings – Design of elastomeric bearing – Segmental construction of bridge – Testing And strengthening of bridge – Inspection and Maintenance of bridges

### **TEXT BOOKS:**

1. Victor D.J “Essential of bridge Engineering”, Oxford & IBH publishing co. 1980.
2. Krishnaraju N. “Bridge Engineering”, CBS Publications, New Delhi.
3. Bindra.S.P., “Principle and practice of Bridge Engineering”, Dhanpat Rai & sons 1979.
4. Ramchandra S. “Design of Steel Structures” Vol I & II, Standard book house, New Delhi, 1978.

## REFERENCES:

1. Ponnusamy “Bridge Engineering”, Tata Mcgraw hill Publishing co, 1995
2. Raina “Concrete bridges practice Analysis design and Economics”, Tata Mcgraw Hill Publishing co 1995.
3. Jagadesh, T.R & Jeyaram M.A., “Design of bridge structures”, Prentice Hall of India Pvt Ltd. 2001
4. Rowe, R.E. “Concrete Bridge Design”, John Wiley & Sons, New York, USA, 1962.
5. Phatak, D.R. “Bridge Engineering”, Satya Prakhasam, New Delhi, 1990

## IS Codes:

1. IRC: 78, “Standard specifications & Code of practice for Road Bridges”.  
Section VII-Foundation and Substructures.
2. IRC: 6-2000, “ Standard specifications & Code of practice for Road Bridges”.  
Section II-Loads and Stresses.
3. IRC: 21-2000, “Standard specifications & Code of practice for Road Bridges”.  
Section III-Cement Concrete (Plain and Reinforced).
4. IRC: 83 Part II-1987, “Standard specifications & Code of practice for Road Bridges”.  
Section: 9 Bearing, Part II – Elastomeric Bearings.
5. IRC: 45-1972, “Recommendations for Estimating the resistance of soil below the maximum scour level in the Design of Well foundations of Bridges.
6. IRC: 78-2000 “Standard specifications & code of practice for Road bridges”.  
Section VII – Foundation and substructures.

## **15BCEU08E4 GROUND WATER HYDROLOGY**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives :**

To make the students get the basic concepts of groundwater and its movement, which will help them to make an assessment of this resource.

### **Specific Objectives of Learning:**

The students apply their knowledge on ground water, well hydraulics to estimate the safe yield and ground water potential

### **UNIT I**

Groundwater occurrence – distribution – aquifer – types - Surface investigation - Geophysical- electrical resistivity - Seismic refraction - Gravity and magnetic - Geologic - Air photo interpretation - Dowsing.

### **UNIT II**

Subsurface investigation - test drilling - resistivity logging- potential logging – temperature and caliper logging.

### **UNIT III**

Steady unidirectional flow - well in a uniform flow - steady flow with uniform recharge - unsteady radial flow to a well - well flow near aquifer boundaries - Multiple well systems - partially penetrating wells - characteristic well losses.

### **UNIT IV**

Secular and seasonal variations - Fluctuations due to evapo-transpiration, Meteorological phenomena, tides, external loads and earthquakes - control by drains and wells. Recharge through sewage pits, shafts and wells.

### **UNIT V**

Occurrence of sea water intrusion - Ghypon-Heizberg relation between fresh and saline waters - shape length and structure of the fresh salt water interface - prevention and control of seawater intrusion - role of sea water in ground water - coastal zoning. Sand models - Electrical models - Viscous fluid models - membrane models – numerical analysis methods.

### **REFERENCES:**

1. Raghunath H.M., Ground Water Hydrology, New-Age International, 2nd Edition, 1990.

## **15BCEU08E5 WATER RESOURCES SYSTEMS ANALYSIS**

C : 3, L : 3, T : 0, P : 0, CFA: 40, ESE: 60

### **Objectives:**

The subject of this course is the planning and management of water resource systems. The course will cover the topics of water planning and management by providing in depth coverage of the tools of analysis, namely optimization and simulation, and by providing the theoretical framework for analysis based on the economics of water and the design of water systems.

### **Specific Objectives of Learning:**

At the completion of this course students will:

- Be able to understand the fundamentals of economic theory as applied to water resources,
- Be familiar with optimization and simulation modeling,
- Be able to design and solve optimization models of water systems,
- Be able to conduct model-based analysis of integrated water resource systems
- 

### **UNIT I SYSTEM APPROACH**

Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – scopes and steps in systems engineering.

### **UNIT II PHYSICAL AND SOCIO - ECONOMIC DATA**

Collection, evaluation and processing – project appraisal – public involvement, master Comprehensive and integrated planning of water resources project.

### **UNIT III LINEAR PROGRAMMING**

Operation research - introduction - Problem Formulation-graphical solution- Simplex method – Sensitivity analysis - simple applications

### **UNIT IV DYNAMIC PROGRAMMING**

Optimality criteria Stage coach problem – Bellman's optimality criteria Problem formulation and Solution - simple applications

### **UNIT V SIMULATION**

Basic principles – Methodology and Philosophy – Model development – input and outputs – Deterministic simulation - simple applications

### **TEXTBOOK:**

1. Vedula, S., and Majumdar, P.P. "Water Resources Systems" – Modeling Techniques and Analysis Tata McGraw Hill, 5th reprint, New Delhi, 2010.

### **REFERENCES:**

1. Hall Warren, A. and John A. Dracup., "Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998
2. Chadurvedi M.C., "Water resource Systems Planning and Management", Tata McGraw Hill inc., New Delhi, 1997
3. Taha H.A., "Operation Research", McMillan Publication Co., New York, 1995.
4. Maass A., Husfchimidt M.M., Dorfman R., Thomas H. A., Marglin S.A and Fair G. M., "Design of Water Resources System", Harvard University Press, Cambridge, Mass., 1995.
5. Goodman Aluvini S., "Principles of Water Resources Planning", Prentice Hall of India, 1984

## **MODULAR COURSE I**

### **15BCEU07M1 DISASTER MANAGEMENT**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

#### **Objectives:**

To study the basic management concepts of Disaster management.

#### **Specific Objectives of Learning:**

At the end of the course the students learnt the disaster types of disaster Hydrological disaster, Atmospheric disaster, forest related disaster, land related disaster, cyclone and other disasters and management with the real case studies of the past disasters.

#### **UNIT I INTRODUCTION**

Introduction to Disaster Management -Contemporary Natural and Man-made Disasters-Fundamentals of Disasters, Causal Factors of Disasters, Poverty, Population Growth, Rapid Urbanization, Transitions in Cultural Practices, Environmental Degradation, War and Civil Strife.- Earthquakes, Tropical Cyclones, Floods, Droughts, Environmental Pollution, Deforestation, Desertification, Epidemics, Chemical and Industrial Accidents.

#### **UNIT II HYDROLOGICAL DISASTERS**

Hydrological, Coastal and Marine Disasters -Flood Hazards, Control and Management-Dams and dam bursts - Tsunami - Water and groundwater hazards - Sea level rise - Coastal and Marine Disasters-Coastal and marine degradation - Marine Pollution - Techniques of Marine Pollution control.

#### **UNIT III ATMOSPHERIC & FOREST RELATED DISASTERS**

Atmospheric Disasters - Greenhouse Effect and global climate - Air Pollution and Acid Rain -Ozone depletion - Forest Related Disasters-Biodiversity Extinction -Deforestation and loss of biological diversity - genetic manipulation –Bio safety and CBD

#### **UNIT IV LAND DISASTERS**

Geological, Mass Movement and Land Disasters -Earthquake -Volcanism -Mass-movement hazards-Land degradation and land use - Droughts and famines- Deserts and desertification – Groundwater over-exploitation, dryness and wildfires - Technological Disasters -Mining disasters -War, chemicals and the environment.

## **UNIT V      CYCLONE AND OTHER DISASTERS**

Wind and Water Driven Disasters -Flood forecasting mitigation planning and management -Tropical cyclones -Storms, hurricanes, tornadoes, lightning and frost disasters  
Case studies – Regulating Hazardous Industries in India - Control of Toxic Chemicals and Chemical Pollution in India

### **TEXT BOOK:**

1. Thomas D.Schneid., “**Disaster Management and Preparedness,**” Tata McGraw Hill, New Delhi,2001.

### **REFERENCE BOOKS:**

1. William L Waugh., “Living with hazards,dealing with disasters:An Introduction to Emergency Management,” Amazon Publications, 2002.
2. Patrick Leon Abbott, “Natural Disasters,” Amazon Publications, 2002.
3. Ben Wisner., “At Risk: Natural Hazards, People vulnerability and disasters,” AmazonPublications, 2001

## **15BCEU07M2 AIR POLLUTION MANAGEMENT**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

### **Objectives:**

- To know the concept of air pollution and various air pollutants.
- To study the control measures for air pollution management
- To study the air quality management.

### **UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

### **UNIT II DISPERSION OF POLLUTANTS**

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

### **UNIT III AIR POLLUTION CONTROL**

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

### **UNIT IV AIR QUALITY MANAGEMENT**

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts– Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

### **UNIT V NOISE POLLUTION**

Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention

### **TEXT BOOKS**

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.
- 4.

### **REFERENCES**

1. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New York, 1997.
2. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.
4. Garg, S.K., “Environmental Engineering Vol. II”, Khanna Publishers, New Delhi
5. Mahajan, S.P., “Pollution Control in Process Industries”, Tata McGraw-Hill, New Delhi, 1991.

## **15BCEU07M3 ENVIRONMENTAL IMPACT ASSESSMENT**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

### **Objectives:**

- To impart knowledge on Environmental management and Environmental Impact Assessment.
- To know about the basics and importance of Environmental Impact Assessment
- To study about the Environmental Impact Statement and methods of EIA.
- To know about the Environmental Management and Prediction Methods
- To study about the Environmental Management Plan
- The broad education necessary to understand the impact of engineering solutions in global, economic, .environmental and social context.

### **UNIT I INTRODUCTION**

Impact of development projects – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA-Stages of EIA, Types of EIA

### **UNIT II METHODOLOGIES**

Methods of EIA – Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives

### **UNIT III PREDICTION AND ASSESSMENT**

Assessment of Impact on land, water, air, social & cultural activities and on flora & fauna- Mathematical models- Public participation

### **UNIT IV ENVIRONMENTAL MANAGEMENT PLAN**

Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People. Post project monitoring

### **UNIT V CASE STUDIES**

EIA for infrastructure projects – Dams – Highways – Multi-storey Buildings – Water Supply and Drainage Projects – Waste water treatment plants, STP.

### **TEXTBOOKS:**

1. Canter, R.L., “Environmental Impact Assessment”, McGraw Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., “Concepts in Environmental Impact Analysis”, Common Wealth Publishers, New Delhi, 1992.

### **REFERENCES:**

1. John G. Rau and David C Hooten “Environmental Impact Analysis Handbook”, McGraw Hill Book Company, 1990.
2. “Environmental Assessment Source book”, Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, “Handbook of Environmental Impact Assessment Vol. I & II”, Blackwell Science, 1999.

## **15BCEU07M4 ARCHITECTURE**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

### **Objectives:**

To make the students to study the basic Architectural design concepts.

### **Specific Objectives of Learning:**

At the end of the course the student gain the knowledge in the Architectural design, climate responsive design, types of climates and design, types of buildings, site planning, zoning and study the regulations for layout planning and urban planning and the landscape design.

### **UNIT I        ARCHITECTURAL DESIGN**

Architectural design - an analysis - Integration of function and aesthetics - Introduction to basic elements and principles of design.

### **UNIT II       CLIMATE RESPONSIVE DESIGN**

Factors that determine climate - Characteristics of climate types - Design for various climate types - Passive and active energy controls.

### **UNIT III      BUILDING TYPES**

Residential, institutional, commercial and Industrial - Planning concepts - Application of anthropometry and space standards - Interrelationships of functions - Safety standards - Building rules and regulations - Integration of building services.

### **UNIT IV      SITE PLANNING**

Surveys - Site analysis - Development control - Zoning regulations - Layout regulations - Urban planning standards - Layout design concepts.

### **UNIT V       ENVIRONMENT DESIGN**

Urban renewal - Conservation - Principles of Landscape design - Case studies

### **REFERENCES:**

1. Francis D.K. Ching, " Architecture: Form, Space and Order ", VNR, N.Y., 1999.
2. Givoni B., " Man Climate and Architecture ", Applied Science, Barking ESSEX, 1982.
3. Edward D. Mills, " Planning the Architects Handbook ", Butterworth London, 1995.
4. Gallian B. Arthur and Simon Eisner, " The Urban Pattern - City Planning and Design ", Affiliated Press Pvt. Ltd., New Delhi, 1995.
5. Margaret Roberts, " An Introduction to Town Planning Planning Techniques ", Hutchinson, London, 1990.

## MODULAR COURSE II

### 15BCEU08M1 TOWN AND COUNTRY PLANNING

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

#### Objectives:

- To advance the study of town planning, civic design and kindred subjects and of the sciences and arts as applied to those subjects.
- To promote planned, economic, scientific and artistic development of towns, cities and rural areas.
- To promote the general interests of those engaged in the practice in town and country planning.

#### UNIT I PLANNING OF TOWNS

Town planning Objective – Necessity and principles of town planning – Origin, growth and stages in development of towns – Brief history of evolution of towns – Ancient and modern towns with historic Examples and international contributions to modern planning Forms of planning – Requirement of new towns – Planning of modern towns – The town and environment – Climate, humidity, wind and radiation – Factors for the selection of site for new town – Powers required to enforce town planning schemes – Present position of planning in India

#### UNIT II TOWN SURVEY NECESSITY

Collection of data – Types of surveys – Uses of surveys – Methods adopted to collect data – Drawings – Reports – Plan structure of a town and layouts

#### UNIT III ZONING, HOUSING AND SLUMS

**Zoning** :Objective – Principles of zoning – Advantage and aspect of zoning – Zoning power – Maps for zoning

**Housing** :Importance – Demand for houses – Building site – Rural housing – Agencies for housing – Housing problem in India – Residential neighborhoods

**Slums** :Causes – Characterizes and effect of slums – Slum clearance and refocusing – Prevention of slum formation – Resources for slum clearance programs

#### UNIT IV PLANNING FOR PARKS AND PLAYGROUNDS

Types of recreation – Location of urban green spaces – Classification of parks – Park system – Finance for park – Playground – Space standards – Landscape architecture

**Planning for Industries** :Classification – Requirements of industry – Setting for industries – Industrial townships – Measures to control location of industries – Planning for new industrial towns

**Planning for public buildings** :Location – Classification – Principles of design of public buildings

## **UNIT V        RE-PLANNING OF EXISTING TOWNS**

Objects of re-planning – Defects of existing towns – Urban renewal and re-development – Decentralization and recentralization – Garden city concept – Surface drains – Refuse of towns Development control – Building bye-laws and planning acts – Master-plan – Objective – Necessity – Features of master plan – Planning standards – Report – Stages of preparation – Method of Execution

### **TEXT BOOKS:**

1. Modal, N.V & Ambedkar, V.N “Town and Country Planning and Housing”, Orient Longman Ltd.
2. New Delhi. .1971
3. Gupta, R.G. “Planning and development of towns”, Oxford and IBH Publishing Co. New Delhi. 1983
4. Rangwala,S.C, Rangwala, K.S and Rangwala, P.S “Town Planning”, Charotar Publishing House, Anand, 2002

### **REFERENCES:**

1. John Rat Cliffe, 1974 “An introduction to town and country planning”, Hutchinson of London, 1999
2. Luis Keeble, “Principles and practice of town and country planning”, MIR Publishers, Moscow, 1989
3. A. Rinishe, “Town planning in hot climates”, MIR Publishers, Moscow,1989

## **15BCEU08M2 GROUND IMPROVEMENT TECHNIQUES**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

### **Objectives;**

- To develop an awareness of problematic soils and selection of ground improvement techniques based on soil conditions
- To understand drainage, dewatering, grouting technique in ground improvement method.
- To aware of the ground improvement techniques.
- To study the applications of geosynthetics.

### **UNIT I INTRODUCTION**

Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, lateric and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

### **UNIT II DRAINAGE AND DEWATERING**

Drainage techniques - Well points - Vacuum and electroosmotic methods – Seepage analysis for two dimensional flow fully and partially penetrating slots in homogenous deposits (Simple cases only).

### **UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS**

Insitu densification of cohesion less and consolidation of cohesive soils –Dynamic compaction and consolidation - Vibrofloatation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.

### **UNIT IV EARTH REINFORCEMENT**

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth - Geotextiles in filtration drainage - Separation and road works.

### **UNIT V GROUND TECHNIQUES**

Types of grouts - Grouting equipment and machinery - Injection methods – Grout monitoring – Stabilization with cement, lime and chemical - Stabilization expansive soils.

### **TEXT BOOKS:**

1. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill, 1994.
2. Purushothama Raj, P."Ground Improvement Techniques", Laxmi Publications (p) Ltd., New Delhi.
- 3.

### **REFERENCES:**

1. Moseley M.P., "Ground Improvement" Blackie Academic and Professional, Chapman and Hall, Glasgow, 1993.
2. Jones J.E.P., "Earth Reinforcement and Soil Structure", Butterworths, 1995.
3. Craig, R.F., "Soil Mechanics", Van Nostrand Reinhold Co., New York, 1993.

## **15BCEU08M3 BUILDING SERVICES**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

### **Objectives:**

To study the building service elements of electrical systems, illumination, refrigeration and fire safety systems.

### **Specific Objectives of Learning:**

- Determine and apply knowledge of complex construction management theory to your professional practice and/or further study
- Professionally communicate to a range of audiences, demonstrating in depth knowledge of the discipline and of the needs of diverse construction management stakeholders
- Apply logical, critical and creative thinking to analyse, synthesise and apply theoretical knowledge, and technical skills, to formulate evidenced based solutions to industry problems or issues
- Collaborate effectively with others and demonstrate intellectual independence and autonomy to solve problems and/or address industry issues and imperatives

### **UNIT I MACHINERIES**

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, aid and electricity.

### **UNIT II ELECTRICAL SYSTEMS IN BUILDINGS**

Basics of electricity – Single/Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations.

### **UNIT III PRINCIPLES OF ILLUMINATION & DESIGN**

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lamps of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically challenged and elderly in building types.

## **UNIT IV      REFRIGERATION PRINCIPLES & APPLICATIONS**

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Sub cooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditions, - Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning system for different types of buildings – Protection against fire to be caused by A.C. systems.

## **UNIT V      FIRE SAFETY INSTALLATION**

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers.

## **REFERENCES**

1. E.R.Ambrose, “Heat Pumps and Electric Heating”, John and Wiley and Sons, Inc., New York, 1968.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968
3. Philips Lighting in Architectural Design, McGraw – Hill, New York, 1964.
4. R.G.Hopkinson and J.D.Kay, “The Lighting of buildings”, Faber and Faber, London, 1969.
5. William H.lSeverns and Julian R.Fellows, “Air-conditioning and Refrigeration”, John Wiley and Sons, London, 1988.
6. A.F.C. Sherratt, “Air – conditioning and Energy Conservation”, The Architectural Press, London, 1980.
7. National Building Code.

## **15BCEU08M4 CONTRACT LAWS AND REGULATIONS**

C : 2, L : 0, T : 0, P : 0, CFA: 50, ESE: 0

### **Objectives:**

Law of Contracts is designed to give students a theoretical and practical understanding of the Indian Law of contract. The course focuses on solving problem questions on contract law and examines fundamental concepts such as tenders, arbitration, and the control of unfair terms, as well as the remedies arising from breach of contract.

### **UNIT I CONSTRUCTION CONTRACTS**

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts

### **UNIT II TENDERS**

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Transparency in Tenders Act.

### **UNIT III ARBITRATION**

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs

### **UNIT IV LEGAL REQUIREMENTS**

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and Their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations

### **UNIT V LABOUR REGULATIONS**

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration– Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamil Nadu Factory Act – Child Labour Act - Other Labour Laws

### **REFERENCES:**

1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M.Tripathi
2. Private Ltd., Bombay, 1982
3. Tamilnadu PWD Code, 1986
4. Jimmie Hinze, Construction Contracts, Second Edition, McGraw Hill, 2001
5. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, Sixth Edition, McGraw Hill, 2000
- 6.