

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
*(Established by Govt. of A.P., Act. No. 30 of 2008)*
**ANANTHAPURAMU – 515 002 (A.P.) INDIA.**
**Course Structure for B.Tech-R15 Regulations**
**Civil Engineering**
**B.Tech III-I Semester (C.E)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A01501	Design and Drawing of RCC Structures	3	1	-	3
2.	15A01502	Estimation, Costing and Valuation	3	1	-	3
3.	15A01503	Geotechnical Engineering – I	3	1	-	3
4.	15A01504	Engineering Geology	3	1	-	3
5.	15A01505	Structural Analysis – II	3	1	-	3
6.		<b>MOOCS-I*</b>	3	1	-	3
	15A01506	1. Cost Effective Housing Techniques				
	15A01507	2. Water Harvesting and Conservation				
7.	15A01508	Engineering Geology Laboratory	-	-	4	2
8.	15A01509	Geotechnical Engineering Laboratory	-	-	4	2
9.	15A99501	Audit course - Social Values & Ethics	2	0	2	0
<b>Total:</b>			<b>20</b>	<b>6</b>	<b>10</b>	<b>22</b>

## B.Tech III-II Semester (C.E)

S. No.	Course Code	Subject	L	T	P	C
1.	15A01601	Concrete Technology	3	1	-	3
2.	15A01602	Design and Drawing of Steel Structures	3	1	-	3
3.	15A01603	Geotechnical Engineering – II	3	1	-	3
4.	15A01604	Transportation Engineering - I	3	1	-	3
5.	15A01605	Water Resources Engineering – I	3	1	-	3
6.		<b>CBCC-I</b>	3	1	-	3
	15A01606	1. Remote Sensing & GIS				
	15A01607	2. Disaster Management & Mitigation				
	15A01608	3. Intellectual Property Rights				
7.	15A01609	Concrete Technology Laboratory	-	-	4	2
8.	15A01610	Transportation Engineering Laboratory	-	-	4	2
9.	15A52602	Advanced English Language Communication Skills (AELCS) Laboratory (Audit Course)	-	-	2	0
10.	15A01611	Comprehensive Online Examination-II	-	-	-	1
<b>Total:</b>			<b>18</b>	<b>06</b>	<b>12</b>	<b>23</b>

6 Theory + 2 Laboratories+1 Comprehensive Online Examination+1 Audit Course

## B.Tech IV-I Semester (C.E)

S. No.	Course Code	Subject	L	T	P	C
1.	15A01701	Finite Element Methods	3	1	-	3
2.	15A01702	Transportation Engineering - II	3	1	-	3
3.	15A01703	Environmental Engineering	3	1	-	3
4.	15A01704	Water Resources Engineering – II	3	1	-	3
5.		<b>CBCC-II</b>	3	1	-	3
	15A01705	1. Design and Drawing of Irrigation Structures				
	15A01706	2. Ground Improvement Techniques				
	15A01707	3. Air Pollution and Quality Control				
6.		<b>CBCC-III</b>	3	1	-	3
	15A01708	1. Bridge Engineering				
	15A01709	2. Earth Quake Resistant Design of Structures				
	15A01710	3. Rehabilitation and Retrofitting of Structures				
7.	15A01711	CAD Laboratory	-	-	4	2
8.	15A01712	Environmental Engineering Laboratory	-	-	4	2
<b>Total:</b>			<b>18</b>	<b>6</b>	<b>8</b>	<b>22</b>

## B.Tech IV-II Semester (C.E)

S. No.	Course Code	Subject	L	T	P	C
1.	15A01801 15A01802	<b>MOOCS – II*</b> 1. Urban Transportation Planning 2. Advanced Structural Engineering	3	1	-	3
2.	15A01803 15A01804	<b>MOOCS – III*</b> 1. Prestressed Concrete 2. Environmental Impact Assessment and Management	3	1	-	3
3.	15A01805	Comprehensive Viva Voce	-	-	4	2
4.	15A01806	Technical Seminar	-	-	4	2
5.	15A01807	Project Work	-	-	24	10
6.	15A01808	Survey Camp**	-	-	-	2
<b>Total:</b>			<b>6</b>	<b>2</b>	<b>32</b>	<b>22</b>

2 Theory + 1 Survey Camp + 1 Technical Seminar + 1 Project work+1 Comprehensive Viva Voce

\*Either by MOOCS manner or Self study or Conventional manner

\*\* The survey camp conducted after II year – II semester, shall be evaluated in IV – II Semester.

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<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A01501 DESIGN & DRAWING OF RCC STRUCTURES**

**Course Objective:** To teach and familiarize the students with the design of various RCC structural elements and to draw them so that they can be implemented in field

**UNIT – I**

Concepts of RCC Design –Introduction to Working stress method - Limit State method – Material Stress- Strain Curves – Safety factors – Characteristic values. Stress Block parameters – IS: 456 – 2000.

**Beams :** Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections.

**UNIT – II**

**Shear, Torsion and Bond :** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

Limit state design for serviceability for deflection, cracking and codal provision.

**UNIT - III**

Design of Two-way slabs, one way slab and continuous slab Using I S Coefficients, Cantilever slab /Canopy slab.

**UNIT –IV**

Short and Long columns –axial loads, uni axial and biaxial bending I S Code provisions.

**UNIT – V**

Design of Footings - isolated (square, rectangular) and Combined footings.

Design of Stair case – Dog legged and Open well.

**NOTE :** All the designs to be taught in Limit State Method

Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Reinforcement particulars of columns and footings.
4. Detailing of One way, two way and continuous slabs

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. Part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions on design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

**TEXT BOOKS:**

1. Design of Reinforced Concrete Structures by K.Subramanian , Oxford University press India.
2. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi
3. Limit State Design of Reinforced Concrete by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

**REFERENCES :**

1. Design of RCC Structures by M.L.Gambhir P.H.I. Publications, New Delhi.
2. Limit State Design of RCC Structures – P.C.Varghese, Printice Hall of India, New Delhi
3. Structural Design and Drawing by N.Krishna Raju, University Press, Hyderabad
4. Reinforced Concrete Design by Pillai & Menon, TMH Publishers.
5. Analysis of Skeletal Structures by Seetharamulu Kaveti, TMH publications.

**Codes/Tables:** IS 456-2000 and IS-800 code books to be permitted into the examinations Hall.

**Course Outcomes:**

*After completing the course, the student*

1. *Will be able to understand the basic concepts of reinforced concrete analysis and design.*
2. *Will be able to understand the behavior and various modes of failure of reinforced concrete members.*
3. *Will be able to analyze and design various reinforced concrete members such as beams, columns, footings and slabs*

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (C.E)**

L	T	P	C
3	1	0	3

**15A01502 ESTIMATION, COSTING AND VALUATION**

**Course Objective:** *The objective of the course is to make the student to understand about estimation of quantities and valuations of different types of structures as per standard schedule of rates.*

**UNIT – I**

**INTRODUCTION :** General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. **STANDARDS SPECIFICATIONS :** Standard specifications for different items of building construction

**UNIT – II**

**ESTIMATION OF BUILDINGS :** Detailed Estimates of Buildings

**UNIT – III**

**EARTHWORK ESTIMATION :** Earthwork for roads and canals.

**REINFORCEMENT ESTIMATION :** Reinforcement bar bending and bar requirement schedules.

**UNIT – IV**

**CONTRACTS AND TENDERS :** Contracts – Types of contracts – Contract Documents – Conditions of contract – Types of Tenders – Requirement of Tendering.

**UNIT – V**

**RATE ANALYSIS :** Working out data for various items of work over head and contingent charges.

**VALUATION :** Valuation of buildings.

**TEXT BOOKS**

1. Estimating and Costing, 27<sup>th</sup> revised edition by B.N. Dutta, UBS publishers, 2000.
2. Civil Engineering Contracts and Estimations, 4<sup>th</sup> edition by B.S.Patil, Universities Press, Hyderabad.

**REFERENCES :**

1. Engineering Construction Cost 6<sup>th</sup> edition by Peurifoy, TMH Publications
2. Estimation, Costing and Specifications by M. Chakraborti; Laxmi publications. Standard Schedule of Rates and Standard Data Book by Public Works Department.
3. I. S. 1200 (Parts I to XXV – 1974/ Method of Measurement of Building and Civil Engineering works – B.I.S.)
4. National Building Code

**Note :** Standard schedule of rates is permitted in the examination hall.

**Course outcomes:**

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

1. *apply different types of estimates for different building elements*
2. *carry out analysis of rates and bill preparation different building elements*
3. *understand the concepts of specification writing*
4. *carry out valuation of assets*

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L	T	P	C
3	1	0	3

**15A01503 GEOTECHNICAL ENGINEERING – I**

**Course Objective:** *The objective of this course is to make the student to understand the behaviour of soil under different loads and different conditions. This is necessary because the safety of any structure depends on soil on which it is going to be constructed.*

**UNIT – I**

**INTRODUCTION:** Soil formation – Soil structure and clay mineralogy – Mass- volume relationship – Relative density.

**INDEX PROPERTIES OF SOILS:** Moisture Content, Specific Gravity, Insitu density, Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils

**UNIT –II**

**PERMEABILITY:** Soil water – capillary rise – Adsorbed water – flow of water through soils – Darcy's law- Permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils.

**SEEPAGE THROUGH SOILS:** Total, neutral and effective stresses –quick sand condition – Seepage through soils – Flow nets: Characteristics and Uses.

**UNIT – III**

**STRESS DISTRIBUTION IN SOILS:** Boussinesq's and Westergaard's theories for point loads and areas of different shapes – Newmark's influence chart.

**COMPACTION:** Mechanism of compaction – factors affecting – effects of compaction on soil properties. – Field compaction Equipment – compaction control.

**UNIT – IV**

**CONSOLIDATION :** Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre consolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods.



**UNIT – V**

**SHEAR STRENGTH OF SOILS** : Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelopes – Shear strength of sands - dilatancy – critical void ratio – Liquefaction- shear strength of clays.

**TEXT BOOKS:**

1. Soil Mechanics and Foundation Engineering By K.R. Arora, Standard Publishers and Distributors, Delhi.
2. Geotechnical Engineering by C. Venkataramiah, New Age International Pvt . Ltd, ( 2002).

**REFERENCES:**

1. Soil Mechanics and Foundations by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt .Ltd, New Delhi.
3. Advanced Soil Mechanics by Braja M.Das, CRC press.
4. Geotechnical Engineering by Debashis Moitra, Universities press

**Course Outcomes:**

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

1. *carry out soil classification*
2. *solve any practical problems related to soil stresses estimation, permeability and seepage including flow net diagram*
3. *estimate the stresses under any system of foundation loads solve practical problems related to consolidation settlement and time rate of settlement*

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**15A01504 ENGINEERING GEOLOGY**

**Course Objectives:** *The objectives of this course is to give the basic knowledge of Geology that is required for construction of various Civil Engineering Structures. The syllabus includes the basics of Geology and gives a suitable picture on the Geological aspects that are to be considered for the planning and construction of major Civil Engineering projects.*

**UNIT – I****INTRODUCTION:**

Importance of Geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.

**WEATHERING OF ROCKS :** Its effect over the properties of rocks importance of weathering with REFERENCE to dams, reservoirs and tunnels weathering of common rock like “Granite”

**MINERALOGY:**

Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar , Quartz , Flint , Jasper, Olivine , Augite , Hornblende , Muscovite , Biotite , Asbestos, Chlorite , Kyanite , Garnet , Talc , Calcite. Study of other common economics minerals such as Pyrite, Hematite , Magnetite, Chrorite , Galena , Pyrolusite , Graphite, Magnesite, and Bauxite.

**UNIT – II****PETROLOGY :**

Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of Igneous. Sedimentary and Metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

**STRUCTURAL GEOLOGY :**

Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults un conformities, and joints – their important types. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India

**UNIT – III****GROUND WATER ,EARTH QUAKE &LAND SLIDES:-**

Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Land slides, their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and land slides.

**UNIT –IV****GEOPHYSICAL STUDIES:-**

Importance of Geophysical studies Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and Geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc.

**UNIT – V****GEOLOGY OF DAMS ,RESERVOIRS AND TUNNELS :**

Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factor's Contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs. Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations ( ie. Tithological, structural and ground water ) in tunneling over break and lining in tunnels.

**TEXT BOOKS:**

- 1) Engineering Geology by N.Chenkesavulu, Mc-Millan, India Ltd. 2005
- 2) Engineering Geology by Vasudev Kanthi, Universities Press, Hyderabad.

**REFERENCES:**

1. Engineering Geology by Duggal.S.K., TMH Publishers.
2. Engineering Geology by Subinoy Gangopadhyay, Oxford University Press.
3. Engineering Geology by Prabin Singh, Katson Pubilcations
4. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications

**Course Outcomes: On completion of this course**

1. *The students will have the knowledge of principles of engineering geology.*
2. *The students will have the knowledge of properties of various rocks and minerals*
3. *The students will be able to judge the suitability of sites for various civil engineering structures.*
4. *The students will exhibit the ability to use the knowledge of geological strata in the analysis and design the civil engineering structures.*
5. *The students will have the knowledge for deciding the suitability of water and soil conservation projects.*

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**15A01505 STRUCTURAL ANALYSIS – II**

**Course Objective:** Indeterminate structures are subjected to different loadings with different support conditions; hence it is necessary to study the behaviour of the structures. This course teaches the student how to apply different analysis methods in determining the structural parameters in elements like beams and columns

**UNIT I**

**ARCHES :** Three hinged arches, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature-Determination of horizontal thrust bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, tied arches – fixed arches – ( No analytical question).

**UNIT-II**

**SLOPE-DEFLECTION & MOMENT DISTRIBUTION METHOD:-**Analysis of single bay, single storey, portal frame including side sway– Stiffness and carry over factors – Distribution factors – Analysis of single storey portal frames – including Sway - Substitute frame analysis by two cycle method.

**UNIT – III****KANI'S METHOD:-**

Analysis of continuous beams – including settlement of supports and single bay, single storey portal frames with side sway by Kani's method.

**UNIT – IV****FLEXIBILITY & STIFFNESS METHODS:-**

Flexibility methods, Introduction, application to continuous beams including support settlements-Introduction to stiffness method and its application application to continuous beams including support settlements.

**UNIT – V****PLASTIC ANALYSIS:**

Introduction – Idealized stress – Strain diagram – shape factors for various sections – Moment curvature relationship – ultimate moment – Plastic hinge – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

**TEXT BOOKS:**

1. Structural Analysis – I by Dr.Hemant Patil, Dr.Yogesh Patil and Jignesh Patil by Synergy Knowledge ware publications, Mumbai.
2. Structural Analysis , 5<sup>th</sup> Edition by Aslam Kassimali, Cengage Publishers.
3. Analysis of structures by Vazrani & Ratwani – Khanna Publications.

**REFERENCES :**

1. Structural Analysis – D.S.Prakasa rao - Univeristy Press, Hyderabad
2. Basic Structural Analysis by K.U.Muthu *et al.*, I.K.International Publishing House Pvt.Ltd
3. Theory of structures by Ramamuratham, Jain book depot , New Delhi.
4. Structural Analysis (Matrix Approach) by Pundit and Gupta – Tata Mc-Graw Hill publishers.
5. Structural Analysis by R.S.Khurmi, S.Chand Publications, New Delhi.

**Course Outcomes:**

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

1. *Apply the methods of indeterminate truss analysis*
2. *Analyse the behaviour of arches through different methods of analysis*
3. *Use various classical methods for analysis of indeterminate structures*
4. *Determine the effect of support settlements for indeterminate structures*
5. *Able to analyze the beam and frames for vertical and horizontal loads and draw SFD and BMD.*
6. *Able to calculate forces in members of truss due to load by stiffness method.*

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<b>B. Tech III-I Sem. (C.E)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>
<b>15A01506 COST EFFECTIVE HOUSING TECHNIQUES (MOOCS – I)</b>				

**Course Objectives:** *The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects. The course focuses on cost effective construction materials and methods. Emphasis is given on the principles of sustainable housing policies and programmes.*

**UNIT – I:-****INTRODUCTION TO HOUSING**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

**UNIT – II:-****HOUSING PROGRAMMES**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

**UNIT – III:-DEVELOPMENT AND ADOPTION OF LOW COST HOUSING TECHNOLOGY:**

Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements - Adopting of total prefabrication of mass housing in India- General remarks on pre cast roofing/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall - Fly ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

**UNIT – IV:-****ALTERNATIVE BUILDING MATERIALS FOR LOW COST HOUSING AND INFRASTRUCTURE SERVICES IN RURAL HOUSES:-**

Introduction - Substitute for scarce materials – Ferrocement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - Low cost Infrastructure services: Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy. Rural Housing: Introduction traditional practice of rural housing continuous - Mud Housing technology-Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

**UNIT – V:-****HOUSING IN DISASTER PRONE AREAS:**

Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement's of structural safety of thin pre-cost roofing units against Earthquake forces -Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

**TEXT BOOKS**

1. Hand book of Low Cost Housing by A.K.Lal – New Age International publishers.
2. Low Cost Housing – G.C. Mathur, IBH Publishers.
3. Housing in India by Francis Cherunilam and Odeyar D Heggade, Himalaya Publishing House, Bombay, 1997.

**REFERENCES:-**

1. Disaster Management by Rajib Shaw, Universities Press, India.
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Building Materials For Low –Income Houses – International Council For Building Research Studies And Documentation.
4. Modern Trends In Housing In Developing Countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G.Annamalai.
5. Properties of Concrete – Neville A.M. Pitman Publishing Limited, London.
6. Light Weight Concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.



**Course Outcomes:**

*The students will have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects with cost effective housing techniques. The student can be in a position to adopt the suitable techniques in rural and disaster prone areas by using locally available materials.*

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L	T	P	C
3	1	0	3

**15A01507 WATER HARVESTING AND CONSERVATION  
(MOOCS – I)**

**Course Objectives:** The course aims at bringing awareness about the need for conservation of Water. The student will be taught different methods of Water Harvesting and also the methods of Water Conservation. He will also learn the principles of Watershed Management.

**UNIT – I**

**Origin, Occurrence & Movement of Groundwater:**-Introduction-sources of ground water – Hydro geological Cycle – Infiltration – natural openings in rocks – zones of aeration , saturation and water table – classification of ground water – laboratory and field methods of sampling ground water- aquifers – aquifuges- aquicludes – aquitards – ill effects due to lowering of water table -Artificial recharge.

**UNIT – II**

**Water Harvesting:** Principles of water harvesting-methods of rainwater harvesting-design of rainwater harvesting structures-Purification Techniques for direct use-Harvesting of surface runoff-onsite detention basin - ponds - types - Recycling of harvested water

**UNIT – III**

**Water Recovery and Reuse:** Perspective on recycle and reuse- factors affecting the development of water reclamation and reuse criteria- elements/components of water reclamation and reuse criteria / guidelines- sewage irrigation- Waste water reclamation-waste water recharge for reuse – Treatment Requirements for Water Reuse-methods.

**UNIT – IV**

**Sustainable Watershed Approach & Watershed Management Practices: Concept of watershed-**Introduction to watershed management- Integrated water resources management- natural resources management-agricultural practices-integrated farming-Conjunctive use of water resources-Community participation-Watershed Management Practices in Arid and Semiarid Regions-Case studies-Short term and long term strategic planning.

**UNIT – V**

**Soil and Water Conservation:** Scope of soil and water conservation-Mechanics and types of erosion-their causes-Soil erosion control measures - bank protection-vegetative barriers-contour bund- contour trenches-contour stone walls-contour ditches-terraces-outlets and grassed waterways-Gully control structures - temporary and permanent - design of permanent soil conservation structures-Design of farm ponds and percolation ponds.

**Text books:**

1. Watershed Management by Murty, J.V.S, New Age Intl., New Delhi .
2. Water Resources Conservation and Management by Chatterjee, S. N.,Atlantic Publishers.
3. Ground Water by S.Ramakrishnan, SCITECH Publishers.

**Reference books:**

1. Advances in Soil and Water Conservation by Pierce, F.J. and Frye, W. W. (1998)., Ann Arbor Press, Michigan.
2. Soil and Water Conservation Engineering, 4th Ed. By Schwab, G. O., Fangmeier, D. D., Elliot, W. J. and Frevert, R. K. (1993), John Wiley and Sons Inc., USA
3. Watershed Management in India by Murthy, J.V.S., Wiley Eastern, New Delhi, 1994 .
4. Irrigation Water Management - Principles and Practice by Dilip Kumar Majumdar,, PHI Pvt.Ltd.NewDelhi-1.
5. Irrigation and Water Power Engineering by Madan Mohan Das & Mimi Das Saikia, PHI learning Pvt. Ltd., NewDelhi-1

**Course Outcomes:** *On completion of the course, the student will be able to*

- a) *Appreciate the importance of Water Conservation*
- b) *Understand the methods of Water Harvesting*
- c) *Understand the principles of Watershed Management and its importance in sustainability*

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (C.E)**

L	T	P	C
0	0	4	2

**15A01508 ENGINEERING GEOLOGY LABORATORY**

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
4. Simple Structural Geology problems.

**LAB EXAMINATION PATTERN:**

1. Description and identification of SIX minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.

**Text Books:-**

1. **Elementary Exercises in Geology by CVRK Prasad, Universities press.**

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (C.E)**

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**15A01509 GEOTECHNICAL ENGINEERING LABORATORY**

**Course Objective:** *To obtain the properties of soils by conducting experiments, it is necessary for students to understand the behavior of soil under various loads and conditions.*

**LIST OF EXPERIMENTS**

1. Atterberg's Limits.
2. Field density-core cutter and sand replacement method
3. Grain size analysis
4. Permeability of soil, constant and variable head test
5. Compaction test
6. CBR Test
7. Consolidation test
8. Unconfined compression test
9. Tri-axial Compression test
10. Direct shear test.
11. Vane shear test

Any eight experiments may be completed.

**LIST OF EQUIPMENT:**

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and Shrinkage limits
3. Field Density apparatus for
  - a) Core cutter method
  - b) Sand Replacement method
4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm,
5. 15mm, and 0.075mm.
6. Hydrometer
7. Permeability Apparatus for
  - a) Constant Head test
  - b) Variable Head test
8. Universal Auto compactor for I.S light and heavy compaction tests.
9. Apparatus for CBR test
10. Sampling tubes and sample extractors.

11. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
12. One dimensional consolidation test apparatus with all accessories.
13. Tri-axial cell with provision for accommodating 38 mm dia specimens.
14. Box shear test apparatus
15. Laboratory vane shear apparatus.
16. Hot Air ovens (Range of Temperature 50-150°C)
17. Moisture cans – 2 dozens.
18. Electronic balances of 500 g capacity with 0.01g least count and 5 kg capacity with least count of 1gm
19. Measuring Jars - 1000CC- 6  
- 100CC- 4
20. Mercury - 500 g
21. Rammers - 2  
Crow bars - 2

**TEXT BOOKS:**

1. Soil Testing Lab Manual by K.V.S. Appa Rao & V.C.C.Rao, University Science Press, Laxmi Publication.
2. Soil Testing for Engineers by S.Mittal and J.P.Shukla, Kahna Publishers, New Delhi.
3. Relevant IS Codes.

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**15A99501 SOCIAL VALUES & ETHICS (AUDIT COURSE)**  
*(Common to all Branches)*

**UNIT - I**

**Introduction and Basic Concepts of Society: Family and Society:** Concept of family, community, PRIs and other community based organizations and society, growing up in the family – dynamics and impact, Human values, Gender Justice.

**Channels of Youth Moments for National Building: NSS & NCC:** History, philosophy, aims & objectives; Emblems, flags, mottos, songs, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries. **Nehru Yuva Kendra (NYK):** Activities – Socio Cultural and Sports.

**UNIT – II**

Activities of NSS, NCC, NYK:

**Citizenship:** Basic Features Constitution of India, Fundamental Rights and Fundamental Duties, Human Rights, Consumer awareness and the legal rights of the consumer, RTI.

**Youth and Crime:** Sociological and psychological Factors influencing youth crime, Peer Mentoring in preventing crimes, Awareness about Anti-Ragging, Cyber Crime and its prevention, Juvenile Justice

**Social Harmony and National Integration:** Indian history and culture, Role of youth in peace-building and conflict resolution, Role of youth in Nation building.

**UNIT – III**

**Environment Issues:** Environment conservation, enrichment and Sustainability, Climate change, Waste management, Natural resource management (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation).

**Health, Hygiene & Sanitation:** Definition, needs and scope of health education, Food and Nutrition, Safe drinking water, Sanitation, Swachh Bharat Abhiyan.

**Disaster Management:** Introduction to Disaster Management, classification of disasters, Role of youth in Disaster Management. Home Nursing, First Aid.

**Civil/ Self Defense:** Civil defense services, aims and objectives of civil defense, Need for self defense training – Teakwondo, Judo, karate etc.,

**UNIT – IV**

**Gender Sensitization:** Understanding Gender – Gender inequality – Role of Family, Society and State; Challenges – Declining Sex Ratio – Sexual Harassment – Domestic Violence; Gender Equality – Initiatives of Government – Schemes, Law; Initiates of NGOs – Awareness, Movements;

**UNIT - V**

**Physical Education :** Games & Sports: Health and Recreation – Biological basis of Physical activity – benefits of exercise – Physical, Psychological, Social; Physiology of Muscular Activity, Respiration, Blood Circulation.

**Yoga:** Basics of Yoga – Yoga Protocol, Postures, Asanas, Pranayama: Introduction of Kriyas, Bandhas and Mudras.

**TEXT BOOKS:**

1. NSS MANUAL
2. SOCIETY AND ENVIRONMENT: A.S.Chauha, Jain Brothers Publications, 6<sup>th</sup> Edition, 2006
3. INDIAN SOCIAL PROBLEM: G.R.Madan, Asian Publisher House
4. INDIAN SOCIAL PROBLEM: Ram Ahuja, Rawat Publications
5. HUMAN SOCIETY: Kingsley Davis, Macmillan
6. SOCIETY: Mac Iver D Page, Macmillan
7. SOCIOLOGY – THEMES AND PERSPECTIVES: Michael Honalambos, Oxford University Press
8. CONSTITUTION OF INDIA: D.D.Basu, Lexis Nexis Butterworth Publishers
9. National Youth Policy 2014 (available on [www.yas.nic.in](http://www.yas.nic.in))
10. TOWARDS A WORLD OF EQUALS: A.Suneetha, Uma Bhugudanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagraj, Asma Rasheed, Gogu Shyamala, Deepa Streenivas and Susie Tharu
11. LIGHT ON YOGA : B.K.S.Iyengar, Penguin Random House Publishers  
[www.un.org](http://www.un.org) [www.india.gov.in](http://www.india.gov.in) [www.yas.nic.in](http://www.yas.nic.in)  
<http://www.who.int/countries/ind/en/>  
<http://www.ndma.gov.in>  
<http://ayush.gov.in/event/common-yoga-protocol-2016-0>



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**15A01601 CONCRETE TECHNOLOGY**

**Course Objective:** Any Civil Engineering student shall have the basic knowledge about the preparation of Concrete and the Technology involved in it as Concrete happens to be the widely used building Material. The subject is designed to give the basic knowledge as well as latest developments in concrete technology.

**UNIT I**

**CEMENTS & ADMIXTURES:** Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Test's on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

**AGGREGATES:** Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

**UNIT – II**

**FRESH & HARDENED CONCRETE:** Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water. Water / Cement ratio – Abram's Law – Gel space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compressive & tensile strength - Curing. Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests –

**UNIT – III**

**SPECIAL CONCRETES:** Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C – Applications – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete – Applications – High performance concrete – Self consolidating concrete – SIFCON – Bacterial concrete( self healing concrete)

**UNIT – IV**

**ELASTICITY, CREEP & SHRINKAGE:**– Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage. Introduction to Non-destructive testing methods – Rebound Hammer – Ultra Pulse Velocity method – Pullout - Codal provisions for NDT.

**UNIT – V**

**MIX DESIGN:** Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – ACI method & IS 10262 method

**TEXT BOOKS:**

1. Properties of Concrete by A.M.Neville – Pearson publication – 4th edition
2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004

**REFERENCES:**

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete: Micro Structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers
3. Concrete Technology by Job Thomas, Cengage Publications.
4. Design of Concrete Mix by Krishna Raju, CBS publishers.

**Course Outcome :**

*After completing the course, the student will be able to do the following:*

1. *The students will be able to check and recommend different constituent of concrete.*
2. *The students will be able to test strength and quality of plastic and set concrete.*
3. *The students will have understanding of application admixture and its effect on properties of concrete.*
4. *The students will be able to design mix of concrete according to availability of ingredients and design needs.*
5. *The students will be able to test various strengths of concrete by destructive and non-destructive testing methods.*

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**15A01602 DESIGN & DRAWING OF STEEL STRUCTURES**

**Course objective:** To understand design specifications, loading and design procedures of different steel structures as per BIS specifications.

**UNIT – I**

Materials – Making of iron and steel – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads and combinations loading wind loads on roof trusses, behavior of steel, local buckling. Concept of limit State Design – Different Limit States as per IS 800 -2007 – Design Strengths- deflection limits – serviceability - Bolted connections – Welded connections – Design Strength – Efficiency of joint – Prying action Types of Welded joints - Design of Tension members – Design Strength of members.

**UNIT – II**

Design of compression members – Buckling class – slenderness ratio / strength design – laced – battened columns –column splice – column base – slab base.

**UNIT – III**

Design of Beams – Plastic moment – Bending and shear strength laterally / supported beams design – Built up sections – large plates Web buckling Crippling and Deflection of beams, Design of Purlin.

**UNIT – IV**

Design of eccentric connections with brackets, Beam end connections – Web angle – Un-stiffened and stiffened seated connections (bolted and Welded types) Design of truss joints

**UNIT – V**

Plate Girder: Design consideration – I S Code recommendations Design of plate girder- Welded – Curtailment of flange plates stiffeners – splicings and connections.

Gantry Girder : Gantry girder impact factors – longitudinal forces, Design of Gantry girders.

**Note:** The students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Compound beams including curtailment of flange plates.

Plate 3 Detailing of Column including lacing and battens.

Plate 4 Detailing of Column bases – slab base and gusseted base

Plate 5 Detailing of steel roof trusses including particulars at joints.

Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

### **FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. Part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions on design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

### **TEXT BOOKS**

1. Design of Steel Structures by Dr.B.C.Punmia,A.K.Jain, Lakshmi Publications.
2. Limit State Design of Steel Structures by Subramanyam,N, Oxford University press, New Delhi
3. Limit State Design of Steel Structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi.

### **REFERENCES**

1. Fundamentals of Structural Steel Design by M.L.Gambhir, TMH publications.
2. Structural Design and Drawing by N.Krishna Raju, University Press, Hyderabad.
3. Structural design in steel by Sarwar Alam Raz, New Age International Publishers, New Delhi
4. Design of Steel Structures by Edwin Gaylord, Charles Gaylord, James Stallmeyer, Tata Mc.Graw-Hill, New Delhi.

#### **Codes/Tables:**

##### **IS Codes:**

- 1) IS -800 – 2007
- 2) IS – 875 – Part III
- 3) Steel Tables.
- 4) Railway Design Standards Code.

and **steel tables** to be permitted into the examination hall.

**Course Outcomes :**

*On completion of course, the student will be in a position -*

- 1. Apply the IS code of practice for the design of steel structural elements*
- 2. Design compression and tension members using simple and built-up sections*
- 3. Students will be able to explain the behaviour and modes of failure of tension members and different connections.*
- 4. Students will be able to analyze and design tension members, bolted connections, welded connections, compression members and beams.*
- 5. Design welded connections for both axial and eccentric forces*

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**15A01603 GEOTECHNICAL ENGINEERING – II**

**Course Objective:** *The knowledge of this subject is essential to use the principles of Soil Mechanics to design the foundations, Earth retaining structures and slope stability safely and economically.*

**UNIT – I**

**SOIL EXPLORATION:** Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

**UNIT – II**

**EARTH SLOPE STABILITY:** Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number- Stability of slopes of earth dams under different conditions.

**UNIT – III**

**EARTH PRESSURE THEORIES:** Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Rebhann's and Culmann's graphical methods

**RETAINING WALLS:** Types of retaining walls – stability of retaining walls.

**UNIT – IV**

**SHALLOW FOUNDATIONS:** Types – choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi's, Meyerhoff's and Skempton's Methods

**ALLOWABLE BEARING PRESSURE :** Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures – Settlement Analysis

**UNIT –V**

**PILE FOUNDATION:** Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests – Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

**WELL FOUNDATIONS:** Types – Different shapes of wells – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts.

**TEXT BOOKS:**

1. Geotechnical Engineering, 4<sup>th</sup> edition by C.Venkataramaiah, New Age Publications.
2. Soil Mechanics and Foundation Engineering by Arora, Standard Publishers and Distributors, Delhi
3. Soil Mechanics and Foundations by – by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

**REFERENCES:**

1. Soil Mechanics and Foundation Engineering by Purushtoma Raj, Pearson Publications
2. Das, B.M., - (1999) Principles of Foundation Engineering –6<sup>th</sup> edition (Indian edition) Thomson Engineering
3. Bowles, J.E., (1988) Foundation Analysis and Design – 4<sup>th</sup> Edition, McGraw-Hill Publishing company, Newyork.
4. Geotechnical Engineering by Debashis Moitra, Universities press

**Course Outcomes:**

*On successful completion of the course, the students will have the:*

1. *Ability to apply the principle of shear strength and settlement analysis for foundation system.*
2. *Ability to design shallow and deep foundations*
3. *Ability to analyze and design earth retaining structures.*
4. *Estimate bearing capacity using IS code methods*

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**15A01604 TRANSPORTATION ENGINEERING – I**

**Course Objective:** *This subject deals with the Planned Development of Highways in India and makes the student aware of the importance of Highways in economic development of a Nation. The subject also deals with various geometric elements of Highways and their Design. Fundamentals of Traffic Engineering also will be taught to the student. The students will be given exposure to Pavement Structure Design by various methods.*

**UNIT I**

**HIGHWAY DEVELOPMENT AND PLANNING:**

Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

**UNIT – II**

**HIGHWAY GEOMETRIC DESIGN:**

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

**UNIT – III**

**TRAFFIC ENGINEERING:**

Basic Parameters of Traffic-Volume, Speed and Density – Definitions and their inter relation – Highway capacity and level of service concept – factors affecting capacity and level of service – Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics-Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.

**TRAFFIC REGULATION AND MANAGEMENT:**

Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings- Specifications - Design of Traffic Signals –Webster Method –Saturation flow – phasing and timing diagrams – Numerical problems.



**UNIT – IV****INTERSECTION DESIGN:**

Conflicts at Intersections- Channelisation: Objectives –Traffic Islands and Design criteria- Types of At-Grade Intersections – Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection.

**UNIT – V****PAVEMENT DESIGN :**

Types of pavements – Difference between flexible and rigid pavements – Pavement Components – Sub grade, Sub base, base and wearing course – Functions of pavement components – Design Factors – Flexible pavement Design methods – G.I method, CBR Method, (as per IRC 37-2002) –Design of Rigid pavements – Critical load positions - Westergaard's stress equations – computing Radius of Relative stiffness and equivalent radius of resisting section – stresses in rigid pavements – Design of Expansion and contraction joints in CC pavements. Design of Dowel bars and Tie bars.

**TEXT BOOKS:**

1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 7<sup>th</sup> edition (2000).
2. Transportation Engineering, Volume – I by C.Venkataramaiah, Universities Press, Hyderabad.
3. Traffic Engineering and Transportation Planning by L.R.Kadiyali and Lal- Khanna Publications.

**REFERENCES:**

1. Principles and Practice of Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications.
2. Text book of Highway Engineering by R.Srinivasa Kumar, Universities Press, Hyderabad.
3. Highway Engineering – Dr.S.K.Sharma, S.Chand Publishers

**Outcomes :**

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

1. *Carry out surveys involved in planning and highway alignment*
2. *Design cross section elements, sight distance, horizontal and vertical alignment*
3. *Implement traffic studies, traffic regulations and control, and intersection design*
4. *Determine the characteristics of pavement materials*
5. *Design flexible and rigid pavements as per irc*

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**15A01605 WATER RESOURCES ENGINEERING-I**
**Course Objective:**

To study the concepts of

- i. Engineering Hydrology and its applications like Runoff estimation, estimation of design discharge and flood routing.
- ii. Irrigation Engineering – Water utilization for Crop growth, canals and their designs.

**UNIT – I**

**INTRODUCTION TO HYDROLOGY:** Engineering hydrology and its applications; Hydrologic cycle; precipitation- types and forms, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, presentation and interpretation of rainfall data.

**DESCRIPTIVE HYDROLOGY:** Evaporation- factors affecting evaporation, measurement of evaporation; Infiltration- factors affecting infiltration, measurement of infiltration, infiltration indices; Run off- Factors affecting run- off, Computation of run-off; Design Flood; Estimation of maximum rate of run-off; separation of base flow.

**UNIT – II**

**HYDROGRAPH ANALYSIS:** Hydrograph; Unit Hydrograph- construction and limitations of Unit hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; S-hydrograph.

**GROUND WATER:** Introduction; Aquifer; Aquiclude; Aquifuge; aquifer parameters- porosity, Specific yield, Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; storage coefficient-coefficient of permeability and transmissibility; well hydraulics- Darcy's law; Steady radial flow to a well –Dupuit's theory for confined and unconfined aquifers; Tube well; Open well; Yield of an open well–Constant level pumping test, Recuperation test.

**UNIT – III**

**IRRIGATION:** Introduction; Necessity and Importance of Irrigation; advantages and ill effects of Irrigation; types of Irrigation; methods of application of Irrigation water; quality for Irrigation water. Duty and delta; duty at various places; relation between duty and delta; factors affecting duty; methods of improving duty.

**WATER REQUIREMENT OF CROPS:** Types of soils, Indian agricultural soils, preparation of land for Irrigation; soil fertility; Soil-water-plant relationship; vertical distribution of soil moisture; soil moisture tension; soil moisture stress; various soil moisture constants; Limiting soil moisture conditions; Depth and frequency of irrigation; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; crop seasons and crop rotation; Irrigation efficiencies; Determination of irrigation requirements of crops; Assessment of Irrigation water. Consumptive use of water-factors affecting consumptive use, direct measurement and determination by use of equations (theory only)

#### **UNIT – IV**

**CHANNELS – SILT THEORIES:** Classification; Canal alignment; Inundation canals; Cross-section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Silt theories–Kennedy's theory, Kennedy's method of channel design; Drawbacks in Kennedy's theory; Lacey's regime theory- Lacey's theory applied to channel design; Defects in Lacey's theory; Comparison of Kennedy's and Lacey's theory.

**WATER LOGGING AND CANAL LINING:** Water logging; Effects of water logging; Causes of water logging; Remedial measures; Saline and alkaline soils and their reclamation; Losses in canal; Lining of irrigation channels – necessity, advantages and disadvantages; Types of lining; Design of lined canal.

#### **UNIT – V**

**DIVERSION HEAD WORKS:** Types of diversion head works; Diversion and Storage head works; weirs and barrages; Layouts of diversion head works; components; Causes and failure of hydraulic structures on permeable foundations; Blighs creep theory; Khoslas theory; Determination of uplift pressure, impervious floors using Blighs and Khoslas theory; Exit gradient.

**CANAL OUTLETS:** Introduction; types of outlet; flexibility, proportionality, setting, hyper proportional outlet, sub-proportional outlet, sensitivity, efficiency of an outlet, drowning ratio, modular limit; pipe outlet; Kennedy's gauge outlet; Gibb's module; canal escape.

#### **TEXT BOOKS:**

1. Irrigation And Water Power Engineering by Punmia & Lal, Laxmi Publications Pvt. Ltd., New Delhi
2. Irrigation Engineering and Hydraulic Structures by S. K. Garg; Khanna Publishers, Delhi.

**REFERENCES:**

1. Engineering Hydrology by K.Subramanya, The Tata Mcgraw Hill Company, Delhi
2. Engineering Hydrology by Jayarami Reddy, Laxmi publications Pvt. Ltd., New Delhi
3. Irrigation and Water Resources & Water Power by P.N.Modi, Standard Book House.

**Course Outcomes :**

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

1. *To understand the basic types of irrigation, irrigation standards and crop water assessment*
2. *To study the different aspects of design of hydraulic structures*
3. *To understand various hydraulic structures such as diversion head works and cross regulators, canal falls and structures involved in cross drainage works*

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**15A01606 REMOTE SENSING AND GIS  
(CBCC – I)**
**Course Objectives:**

1. To understand the Photogrammetric techniques, concepts, components of Photogrammetry
2. To introduce the students to the basic concepts and principles of various components of remote sensing.
3. To provide an exposure to GIS and its practical applications in Civil Engineering
4. Analyze the energy interactions in the atmosphere and earth surface features

**UNIT – I****INTRODUCTION TO PHOTOGRAMMETRY:**

Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducially points, parallax measurement using fiducially line.

**UNIT – II****REMOTE SENSING :**

Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

**UNIT – III****GEOGRAPHIC INFORMATION SYSTEM:**

Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

**TYPES OF DATA REPRESENTATION:**

Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

**UNIT – IV****GIS SPATIAL ANALYSIS:**

Computational Analysis Methods(CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

**UNIT – V****WATER RESOURCES APPLICATIONS:**

Land use/Land cover in water resources, Surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring, Watershed management for sustainable development and Watershed characteristics.

Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting, Identification of sites for artificial Recharge structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

**TEXT BOOKS:**

- 1 Remote Sensing and GIS by B.Bhatta, Oxford University Press, New Delhi.
- 2 Fundamentals of remote sensing by Gorge Joseph , Universities press, Hyderabad

**REFERENCES:**

1. Advanced Surveying : Total Station GIS and Remote Sensing – Satheesh Gopi – Pearson Publication.
2. Remote Sensing and its applications by LRA Narayana University Press 1999.
3. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
4. Remote sensing and GIS by M.Anji Reddy ,B.S.Publiications, New Delhi.
5. GIS by Kang – Tsung Chang, TMH Publications & Co.,

**Course Outcomes:**

*On completion of the course the students will have knowledge on*

1. *Principles of Remote Sensing and GIS*
2. *Analysis of RS and GIS data and interpreting the data for modeling applications*

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**15A01607 DISASTER MANAGEMENT AND MITIGATION  
(CBCC – I)**

**Course Objective:-***The objectives of this subject is to give the basic knowledge of Environmental Hazards and disasters. The syllabus includes the basics of Endogenous and Exogenous hazards and gives a suitable picture on the different types of hazard and disaster mitigation methods.*

**Unit-I**

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

**Unit –II**

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards –

**Unit–III**

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

**Unit –IV**

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters Infrequent events: Cyclones – Lightning – Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation)Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves. Floods:- Causes of floods- Flood hazards India- Flood control measures ( Human adjustment, perception & mitigation).Droughts:- Impacts of droughts- Drought hazards in India- Drought control

measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards /Disasters-  
Physical hazards/ Disasters-Soil Erosion

Soil Erosion:-- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion. Chemical hazards/ disasters:-- Release of toxic chemicals, nuclear explosion- Sedimentation processes. Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation. Biological hazards/ disasters:- Population Explosion.

### **Unit –V**

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

### **Text books:**

1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Disaster Mitigation: Experiences And Reflections by [Pardeep Sahnj](#)
4. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

### **References:**

1. The Environment as Hazards by Kates, B.I & White, G.F, Oxford Publishers, New York, 1978
2. Disaster Management by R.B. Singh (Ed), Rawat Publication, New Delhi, 2000
3. Disaster Management by H.K. Gupta (Ed), Universiters Press, India, 2003
4. Space Technology for Disaster Mitigation in India (INCED) by R.B. Singh,, University of Tokyo,1994.

### **Course Outcomes:**

*On completion of the course the students will have knowledge on*

1. *Types of disasters and their effects on environment*
2. *Causes of disasters*
3. *Disaster management through engineering applications*



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech III-II Sem. (C.E)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A01608 INTELLECTUAL PROPERTY RIGHTS  
(CBCC – I)**

**COURSE OBJECTIVE:**

*This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.*

**UNIT – I**

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

**UNIT – II**

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

**UNIT – III**

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law. Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

**UNIT – IV**

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation. Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

**UNIT – V**

New Developments Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.  
International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual Property Rights, Deborah. E. Bouchoux, Cengage Learning.
2. Intellectual Property Rights– Unleashmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,

**Course Outcomes:**

*On completion of this course, the student will have an understanding of the following:*

- a) *Intellectual Property Rights and what they mean*
- b) *Trade Marks and Patents and how to register them*
- c) *Laws Protecting the Trade Marks and Patents*
- d) *Copy Right and laws related to it.*

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-II Sem. (C.E)

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15A01609

CONCRETE TECHNOLOGY LABORATORY

1. Normal Consistency of fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity and soundness of cement.
4. Compressive strength of cement.
5. Workability test on concrete by compaction factor, slump and Vee-bee.
6. Young's modulus and compressive strength of concrete.
7. Specific Gravity and Water Absorption of Coarse aggregate.
8. Bulking of Fine aggregate.
9. Non-Destructive testing on concrete (for demonstration)

**LIST OF EQUIPMENT:**

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers.
4. Los angles Abrasion test machine
5. Vicat's apparatus
6. Specific gravity bottle.
7. Lechatlier's apparatus.
8. Slump and compaction factor setups
9. Longitudinal compressor meter and 1
10. Rebound hammer, Pulse velocity machine.
11. Relevant IS Codes

**Reference books:-**

1. Concrete Manual by M.L.Gambhir, Dhanpat Rai&co., Fourth edition.
2. Building construction and materials(Lab Manual) by Gambhir , TMH publishers.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (C.E)**

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**15A01610 TRANSPORTATION ENGINEERING LABORATORY****I. ROAD AGGREGATES:**

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Abrasion Test.
5. Shape tests

**II. BITUMINOUS MATERIALS :**

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.

**III TRAFFIC FIELD STUDIES**

1. Traffic Volume Studies at Mid-block and Data Analysis
2. Traffic Volume Studies at Intersection and Data Analysis
3. Speed Studies and Data Analysis

**LIST OF EQUIPMENT:**

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers.
4. Los angles Abrasion test machine
5. Length and elongation gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Penskey – Morten's apparatus
11. Relevant IS Codes

**TEXT BOOKS:-**

1. S.K. Khanna and C.E.G Justo, Highway Materials Testing Laboratory Manual, Nem Chand Bros. Roorkee
2. Lab manual on High way Engineering by Ajay.K.Duggal & Vijay .P.Puri, New Age Publications, New Delhi

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-II Sem. (C.E)

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**15A52602      ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS  
(AELCS) LAB (Audit Course)****1. INTRODUCTION**

With increased globalization and rapidly changing industry expectations, employers are looking for the wide cluster of skills to cater to the changing demand. The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information and to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Taking part in social and professional communication.

**1. OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**3. SYLLABUS:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

**UNIT-I: COMMUNICATION SKILLS**

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary Development
4. Common Errors

**UNIT-II: WRITING SKILLS**

1. Report writing
2. Resume Preparation
3. E-mail Writing

**UNIT-III: PRESENTATION SKILLS**

1. Oral presentation
2. Power point presentation
3. Poster presentation

**UNIT-IV: GETTING READY FOR JOB**

1. Debates
2. Group discussions
3. Job Interviews

**UNIT-V: INTERPERSONAL SKILLS**

1. Time Management
2. Problem Solving & Decision Making
3. Etiquettes

**4. LEARNING OUTCOMES:**

- Accomplishment of sound vocabulary and its proper use contextually
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities
- 

**5. MINIMUM REQUIREMENT:**

The Advanced English Communication Skills (AECS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system

- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

## 6. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and G

1. **Walden Infotech: Advanced English Communication Skills Lab**
2. **K-VAN SOLUTIONS-Advanced English Language Communication Skills lab**
3. **DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.**
4. **TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)**
5. **Train2success.com**

## 7. BOOKS RECOMMENDED:

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4<sup>th</sup> edition, Tata Mc Graw Hill.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 3<sup>rd</sup> Edn. 2015.
3. **Essay Writing for Exams, Audrone Raskauskiene, Irena Ragaisiene & Ramute Zemaitiene, OUP, 2016**
4. **Soft Skills for Everyone**, Butterfield Jeff, Cengage Publications, 2011.
5. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Campus to Corporate**, Gangadhar Joshi, Sage Publications, 2015
7. **Communicative English**, E Suresh Kumar & P.Sreehari, Orient Blackswan, 2009.
8. **English for Success in Competitive Exams**, Philip Sunil Solomon OUP, 2015

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B. Tech IV-I Sem. (C.E)

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**15A01701 FINITE ELEMENT METHODS**

**Course Objective:** To familiarize the student with the latest developments in analysis for Civil Engineering problems using Finite Element Methods.

**UNIT –I**

**INTRODUCTION:** Concepts of FEM – Steps involved – Merits & Demerits – Energy Principles – Discretization – Rayleigh –Ritz method of functional approximation.

**PRINCIPLES OF ELASTICITY:** Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

**UNIT –II**

**ONE DIMENSIONAL & TWO DIMENSIONAL ELEMENTS:** Stiffness matrix for bar element – shape functions for one dimensional elements – one dimensional problems .Two Dimensional Elements - Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

**UNIT –III**

**GENERATION OF ELEMENT :** Generation of element stiffness and nodal load matrices for 3-node triangular element and four noded rectangular elements.

**UNIT –IV****ISOPARAMETRIC FORMULATION:**

Concepts of, isoparametric elements for 2D analysis –formulation of CST element, 4 – Noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

**AXI-SYMMETRIC ANALYSIS:** Basic principles-Formulation of 4-noded iso-parametric axi-symmetric element

**UNIT-V**

**SOLUTION TECHNIQUES:** Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.



**TEXT BOOKS:**

1. Finite Element Analysis for Engineering and Technology, Tirupathi R Chandraputla, Universities Press Pvt Ltd, Hyderabad. 2003.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers
3. Finite Element Methods by R.Dhanaraj& K.Prabhakar Nair, Oxford Publishers.

**REFERENCES:**

1. Finite Element Methods in Civil Engineering by M.Rama Narasimha Reddy, Dr.K.Sreenivasu Reddy, D.Srinivasulu Reddy, Sci-Tech Publications Pvt.Ltd.
2. Finite Element Analysis And Procedures In Engineering by H.V.Lakshminaryana, 3<sup>rd</sup> Edition, Universities Press, Hyderabad.
3. A First Course in the Finite Element Methods by Daryl Logan, Cengage Publishers.
4. Finite Element Analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, New Delhi.
5. Finite Element Analysis By S.S. Bhavakatti-New Age International Publishers

**Course Outcomes:**

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

1. *Demonstrate the differential equilibrium equations and their relationship*
2. *Apply numerical methods to FEM*
3. *Demonstrate the displacement models and load vectors*
4. *Compute the stiffness matrix for isoperimetric elements*
5. *Analyze plane stress and plane strain problems*

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<b>15A01702 TRANSPORTATION ENGINEERING – II</b>				

**Course Objective:**

*This subject deals with different components of Transportation Engineering like Railway, Airport Engineering, Ports & harbours. Sound knowledge can be acquired on components of airports, railways, docks and harbours after completion of course*

**Unit – I:****Railway Engineering:**

Introduction – Permanent Way Components – Cross Section Of Permanent Way – Functions And Requirements Of Rails, Sleepers And Ballast – Types Of Gauges – Creep Of Rails – Theories Related To Creep – Coning Of Wheels – Adzing Of Sleepers – Rail Fastenings.

**Unit – II:****Geometric Design Of Railway Track:**

Gradients – Grade Compensation – Cant And Negative Super Elevation – Cant Deficiency – Degree Of Curves – Safe Speed On Railway Track – Points And Crossings – Layout And Functioning Of Left Hand Turn Out And Right Hand Turn Outs – Station Yards – Signaling And Interlocking.

**Unit –III:****Airport Engineering:**

Airport Site Selection – Factors Affecting Site Selection And Surveys- Runway Orientation – Wind Rose Diagram – Basic Runway Length – Correction For Runway Length – Terminal Area – Layout And Functions – Concepts Of Terminal Building – Simple Building , Linear Concept, Pier Concept And Satellite Concept – Typical Layouts

**Unit – IV:****Geometric Design Of Runways And Taxiways:**

Aircraft Characteristics – Influence Of Characteristics On Airport Planning And Design – Geometric Design Elements Of Runway – Standards And Specifications As Per - Functions Of Taxiways – Taxiway Geometric Design – Geometric Elements And Standard Specifications – Runway And Taxiway Lighting.

**Unit – V:****Ports and Harbours:**

Requirements Of Ports And Harbours – Types Of Ports – Classification Of Harbours – Docks And Types Of Docks – Dry Docks, Wharves And Jetties – Breakwaters: Layouts Of Different Types Of Harbours And Docks – Dredging Operations – Navigation Aids.

**Text Books:**

1. A Text Book of Railway Engineering-S.C.Saxena and S.Arora, Dhanpatrai and Sons, New Delhi.
2. Transportation Engineering:Railways,Airports,Docks and Harbours, Bridges and Tunnels, by C.Venkataramaiah, Universities Press, Hyderabad (2016)
3. Airport Planning and Design- S.K. Khanna and M.G Arora, Nemchand Bros.

**References:**

1. Highway, Railway, Airport and Harbour Engineering – K.P. Subramanian, Scitech publishers.
2. Harbour, Dock and Tunnel Engineering – R. Srinivasan, Charotar Publishing House Pvt. Limited, 2009
3. A Text book of Transportation Engineering – S.P.Chandola – S.Chand & Co. Ltd. – (2001).
4. Dock and Harbour Engineering – Hasmukh P Oza, Gutam H Oza, Chartor Publishers pvt ltd.

**Course Outcomes:**

*On completion of this course, the student will be able to*

*Understand the components of Permanent way and their functions*

- a) *Able to understand the geometric design elements of Railway Track and their design methods*
- b) *Understand the aircraft characteristics and their influence on various design elements*
- c) *Acquire the knowledge of types of Docks, Ports and Harbours*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (C.E)**

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**15A01703 ENVIRONMENTAL ENGINEERING**

**Course Objective:** *This subject provides the knowledge of water sources, water treatment, design of distribution system, waste water treatment, and safe disposal methods. The topics of characteristics of waste water, sludge digestion are also included.*

**UNIT – I**

**INTRODUCTION:** Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer.

**WATER DEMAND AND QUANTITY STUDIES :** Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.

**QUALITY AND ANALYSIS OF WATER:** Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

**UNIT - II**

**WATER TREATMENT:** Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants – feeding arrangements. Filtration and Chlorination: Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other disinfection practices- Miscellaneous treatment methods

**WATER DISTRIBUTION :** Distribution systems – Requirements, Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe methods service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house, waste detection and prevention.

**UNIT – III**

**INTRODUCTION TO SANITATION :** systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage

systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers – Hydraulics of sewers and storm drains– design of sewers – materials for sewers- appurtenances in sewerage – cleaning and ventilation of sewers .

**WASTE WATER COLLECTION AND CHARACTERSTICS** : Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow – characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations.

#### **UNIT IV**

**WASTE WATER TREATMENT:** Layout and general out line of various units in a waste water treatment plant – primary treatment: design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – biological treatment – trickling filters – standard and high rate – Construction and design of Oxidation ponds.

**SLUDGE TREATMENT:** Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks and Imhoff Tanks, working principles and design – soak pits.

#### **UNIT – V**

**SOLID WASTE MANAGEMENT:** Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

**AIR POLLUTION:** Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

**NOISE POLLUTION:** Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

#### **TEXT BOOKS:**

1. Water Supply And Sanitary Engineering By G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, Waste Water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Environmental Engineering By Peavy, TMH Publishers.

**REFERENCES :**

1. Environmental Science and Engineering by J.G.Henry and G.W.Heinke – Person Education..
2. Waste Water Treatment- Concepts And Design Approach By G.L. Karia And R.A. Christian, Prentice Hall Of India
3. Elements Of Environmental Engineering By K.N. Duggal, S. Chand Publishers.

**Course Outcomes:**

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

1. *Identify the source of water and water demand*
2. *Apply the water treatment concept and methods*
3. *Apply water distribution processes and operation and maintenance of water supply*
4. *Prepare basic process designs of water and wastewater treatment plants collect, reduce, analyze, and evaluate basic water quality data*
5. *Determine the sewage characteristics and design various sewage treatment plants*
6. *Carry out municipal water and wastewater treatment system design and operation*
7. *Apply environmental treatment technologies and design processes*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
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**15A01704 WATER RESOURCES ENGINEERING-II**

**Course Objective:** *This subject aims to impart the knowledge of various head works, canal structures and their design principles to the students. The subject also covers the river structures, their classifications, designs, etc.*

**UNIT – 1**

**CANAL REGULATION WORKS:** Canal falls: Necessity and location of falls; Types of falls; classification of falls; cistern design; roughening devices; design of sarda type fall. Canal regulators: off-take alignment; head regulators and cross-regulators; design of cross-regulator and distributary head regulator.

**CROSS DRAINAGE WORKS:** Introduction; types of cross drainage works; selection of suitable type of cross drainage work; classification of aqueducts and siphon aqueducts.

**UNIT-II**

**STREAM GAUGING:** Necessity; Selection of gauging sites; methods of Discharge Measurement; Area-Velocity method; Slope-Area method; Tracer method, Electromagnetic induction method; Ultrasonic method; Measurement of depth – Sounding rod, Echo-sounder; Measurement of velocity: Floats – Surface floats, Sub-surface float or Double float, Velocity rod; Pitot tube; Current meter- rating of current meter, measurement of velocity; chemical method; Measurement of stage-Staff gauge, wire gauge, water stage recorder, bubble gauge recorder; stage-discharge curve.

**RIVER ENGINEERING:** Classification of rivers; Meandering; Causes of meandering; Basic factors controlling process of meandering; Aggrading type of river; Degrading type of River; River training: objectives, Classification of river training works; Types of River training works : Guide banks, Marginal embankments ,Groynes or spur, levees, bank protection, pitched islands.

**UNIT-III**

**RESERVOIR PLANNING:** Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Sediment flow in streams: Reservoir sedimentation; Life of reservoir; Reservoir sediment control; Flood routing; Methods of flood routing-Graphical Method (Inflow – storage discharge curves method).

**DAMS :GENERAL:** Introduction; Classification according to use; classification according to material- Gravity dams, Arch dams, Buttress dams, Steel dams, Timber dams, Earth dams and rock fill dams-advantages and disadvantages; Physical factors governing selection of type of dam ; selection of site for a dam.

#### **UNIT-IV**

**GRAVITY DAMS:** Introduction; Forces acting on a gravity dam; Combination of loading for design; Modes of failure: stability requirements; principal and shear stresses; Stability analysis; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam- High and low gravity dams; Design of gravity dams–single step method; Galleries; Stability analysis of non–overflow section of Gravity dam.

**EARTH DAMS:** Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams; Section of an earth dam; Design to suit available materials; Seepage control measures; Slope protection. Seepage through earth dam – graphical method

#### **UNIT-V**

**SPILLWAYS:** Introduction; Types of spillways; Profile of ogee spillway; Energy dissipation below spillways for relative positions of jump height curve and tail water curve; Stilling basins; Indian standards on criteria for design of hydraulic jump type stilling basins with horizontal aprons; Spillway crest gates-Types and description only.

**WATER POWER ENGINEERING:** Development of hydro power in India; Classification of hydel plants: runoff river plants, storage plants and pumped storage plants; low, medium and high head schemes ; Investigation and planning; components of hydel schemes – fore bay, intake structure, surge tanks, penstocks ,power house, turbines-selection of suitable type of turbine, Scroll casing ,draft tube and tail race; assessment of available power; definition of gross head,operating head ,effective head; Flow duration curve; Power duration curve; Load duration curve; Load curve ; primary power and secondary power; installed capacity, dependable capacity; firm power, secondary power; power factor ;load factor, capacity factor ,utilization factor and Diversity factor.

#### **TEXT BOOKS:**

1. Irrigation and Water Power Engineering by Dr. B.C.Punmia & Dr. Pande B.B. Lal; Laxmi Publications pvt. Ltd., New Delhi.
2. Irrigation Engineering and Hydraulic Structure by S. K. Garg; Khanna Publishers, Delhi.



**REFERENCES:**

1. Irrigation And Water Resources Engineering By G.L. Asawa, New Age International Publishers
2. Irrigation, Waterpower And Water Resources Engineering By K R Arora; Standard Publication, New Delhi.
3. Water Resources Engineering By Satyanarayana Murthy. Challa, New Age International Publishers

**Course Outcomes:**

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

1. *Design various canal systems*
2. *Design head and cross regulator structures*
3. *Identify various types of reservoir and their design aspects*
4. *By the Establishes the understanding of cross drainage works and its design*  
*Design different types of dams*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

B. Tech IV-I Sem. (C.E)

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15A01705    **DESIGN AND DRAWING OF IRRIGATION STRUCTURES  
(CBCC-II)**

**Course Objectives:**

1. To provide the knowledge of design of reservoir, operation and sedimentation
2. To provide knowledge on various hydraulic structures such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works

**Design and drawing of the following irrigation structures.**

1. Sloping glacis weir
2. Surplus weir.
3. Tank sluice with tower head
4. Type III Syphon aqueduct.
5. Canal regulator.

**Final Examination pattern:** Any two questions of the above Five designs may be asked out of which the candidate has to answer one question. The duration of examination will be three hours.

**TEXT BOOKS:**

1. Design Of Minor Irrigation And Canal Structures By C.Satyanarayana Murthy, New Age Publications.
2. Irrigation Engineering And Hydraulic Structures By S.K.Garg, Standard Book House.

**Course Outcomes:**

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

1. design various irrigation structures like head and cross regulator structures
2. identify various types of reservoirs and their design aspects

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**15A01706 GROUND IMPROVEMENT TECHNIQUES  
(CBCC - II)**

**Course Objective:-** *The knowledge on the problems posed by the problematic soils and the remedies to build the various structures in problematic soils will be imparted to the students.*

**UNIT – I**

**DEWATERING:** Methods Of De-Watering- Sumps And Interceptor Ditches- Single, Multi Stage Well Points - Vacuum Well Points- Horizontal Wells-Foundation Drains- Blanket Drains- Criteria For Selection Of Fill Material Around Drains –Electro-Osmosis.

**GROUTING:** Objectives Of Grouting- Grouts And Their Properties- Grouting Methods- Ascending, Descending And Stage Grouting- Hydraulic Fracturing In Soils And Rocks- Post Grout Test.

**UNIT – II**

**DENSIFICATION METHODS IN GRANULAR SOILS:-**

In – Situ Densification Methods In Granular Soils:- Vibration At The Ground Surface, Impact At The Ground Surface, Vibration At Depth, Impact At Depth.

**DENSIFICATION METHODS IN COHESIVE SOILS:-**

In – Situ Densification Methods In Cohesive Soils:- Preloading Or Dewatering, Vertical Drains – Sand Drains, Sand Wick Geodrains – Stone And Lime Columns – Thermal Methods.

**UNIT – III**

**STABILISATION:** Methods Of Stabilization-Mechanical-Cement- Lime-Bituminous-Chemical Stabilization With Calcium Chloride, Sodium Silicate And Gypsum

**UNIT – IV**

**REINFORCED EARTH:** Principles – Components Of Reinforced Earth – Factors Governing Design Of Reinforced Earth Walls – Design Principles Of Reinforced Earth Walls.

**GEOSYNTHETICS :** Geotextiles- Types, Functions And Applications – Geogrids And Geomembranes – Functions And Applications.

**UNIT - V**

**EXPANSIVE SOILS:** Problems Of Expansive Soils – Tests For Identification – Methods Of Determination Of Swell Pressure. Improvement Of Expansive Soils – Foundation Techniques In Expansive Soils – Under Reamed Piles.

**TEXT BOOKS:**

1. Engineering Principles of Ground Modification, Haussmann M.R. (1990), McGraw-Hill International Edition.
2. Ground Improvement Techniques by Dr.P.Purushotham Raj, Laxmi Publications, New Delhi / University Science Press, New Delhi
3. Ground Improvement Techniques by Nihar Ranajan Patra. Vikas Publications, New Delhi

**REFERENCES:**

1. Ground Improvement, Blackie Academic and Professional by Moseley M.P. (1993), Boca Taton, Florida, USA.
2. Ground Control and Improvement by Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994), John Wiley and Sons, New York, USA.
3. Designing with Geosynthetics by Robert M. Koerner, Prentice Hall New Jerce, USA

**Course Outcomes:**

*On completion of this course the students will be able to*

1. *Identify the problems in Expansive soils*
2. *Implement the stabilization methods*
3. *Apply grouting and dewatering techniques*

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**15A01707 AIR POLLUTION AND QUALITY CONTROL  
(CBCC - II)**

**Course Objectives:**

1. To make the student to understand the aspects of atmospheric pollution
2. To throw light on the issues such as atmospheric composition, monitoring, acidic deposition, urban air quality
3. To make the student to understand the use of models in air pollution studies

**UNIT – I**

**INTRODUCTION** : Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources.

**EFFECTS OF AIR POLLUTION:** Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

**UNIT-II**

**THERMODYNAMIC OF AIR POLLUTION:**

Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like Sox, Nox, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion.

**PLUME BEHAVIOUR** : Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

**UNIT-III**

**POLLUTANT DISPERSION MODELS** : Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

**CONTROL OF PARTICULATES** : Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control, Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

**UNIT – IV**

**CONTROL OF GASEOUS POLLUTANTS** : General Methods of Control of Nox and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

**UNIT – V**

**AIR QUALITY MANAGEMENT:** Air Quality Management – Monitoring of SPM, SO<sub>x</sub>; NO<sub>x</sub> and CO Emission Standards– Air sampling – Sampling Techniques – High volume air sampler – Stack sampling - Analysis of Air pollutants – Air quality standards – Air pollution control act.

**TEXT BOOKS:**

1. Air Pollution By M.N.Rao And H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air Quality By Thod Godish, Levis Publishers, Special India Edition, New Delhi
3. Environmental Pollution Control Engineering, 2nd Edition By Rao C.S. (2006), New Age International, Newdelhi

**REFERENCE:**

1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution and Control by K.V.S.G.Murali Krishna, Kousal & Co. Publications, New Delhi.
3. Air Pollution Control Engineering, 2nd Edition by Noel De Nevers (2000), McGraw Hill International Edition.

**Course Outcomes :**

*Students will be able to*

1. *Describe the main chemical components and reactions in the atmosphere and examine the factors responsible for perturbing these*
2. *Implement the methods for monitoring and modeling spatial and temporal patterns of pollution*
3. *Assess the environmental impacts of atmospheric pollution.*

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**15A01708 BRIDGE ENGINEERING  
(CBCC - III)**

**Course Objective:** This course deals with different types of Bridges like deck slab bridge, T – Beam Bridge and gives a good knowledge on different components of bridges.

**UNIT - I**

**INTRODUCTION:**

Importance Of Site Investigation In Bridge Design. Highway Bridge Loading Standards. Impact Factor. Railway Bridge Loading Standards (B.G. ML Bridge) Various Loads In Bridges.

**BOX CULVERT :** General Aspects. Design Loads, Design Of Box Culvert Subjected To RC Class AA Tracked Vehicle Only.

**BRIDGE BEARINGS :**

General Features – Types Of Bearings – Design Principles Of Steel Rocker & Roller Bearings – Design Of A Steel Rocker Bearing – Design Of Elastometric Pad Bearing.

**UNIT - II**

**DECK SLAB BRIDGE :**

Introduction – Effective Width Method Of Analysis Design Of Deck Slab Bridge (Simply Supported) Subjected To Class AA Tracked Vehicle Only.

**UNIT - III**

**BEAM & SLAB BRIDGE (T-BEAM BRIDGE)**

General Features – Design Of Interior Panel Of Slab – Pigeauds Method – Design Of A T-Beam Bridge Subjected To Class AA Tracked Vehicle Only.

**UNIT – IV**

**PLATE GIRDER BRIDGE :**

Introduction – Elements Of A Plate Girder And Their Design. Design Of A Deck Type Welded Plate Girder – Bridge Of Single Line B.G.

**COMPOSITE BRIDGES :**

Introduction – Advantages – Design Of Composite Bridges Consisting Of RCC Slabs Over Steel Girders' Including Shear Connectors

**UNIT V****PIERS & ABUTMENTS:**

General Features – Bed Block – Materials Piers & Abutments Types Of Piers – Forces Acting On Piers – Stability Analysis Of Piers – General Features Of Abutments – Forces Acting On Abutments – Stability Analysis Of Abutments – Types Of Wing Walls – Approaches – Types Of Bridge Foundations (Excluding Design).

**TEXT BOOKS :**

1. Bridge Engineering By Ponnu Swamy, TATA Mcgraw Hill Company, New Delhi.
2. Design Of Bridges By N.Krishnam Raju, Oxford & IBH, Publishing Company Pvt.Ltd., Delhi.
3. Relevant – IRC & Railway Bridge Codes.

**REFERENCE :-**

1. Design Of Steel Structures, By B.C. Punmia, Ashok Kumar Jain And Arun Kumar Jain, Laxmi Publications, New Delhi.
2. Essentials Of Bridge Engineering By D.J.Victor, Oxford IBH Publishers Ltd
3. Design Of R.C.C. Structures B.C. Punmia, Ashok Kumar Jain And Arun Kumar Jain, Laxmi Publications, New Delhi.
4. Design Of Bridges Structure By T.R.Jagadish & M.A.Jayaram Prentice Hall Of India Pvt., Delhi.

**Course Outcomes:**

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

1. *Design the basic components of bridge structures like bridge deck slabs, longitudinal girders, transverse girders, piers and well foundations.*
2. *Understand the IRC classes of loading and railway bridge rules for detailed calculation of loadings and design of various components.*
3. *Know the methods of design of structural components of different types of Bridges*



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**15A01709 EARTHQUAKE RESISTANT DESIGN OF STRUCTURES  
(CBCC - III)**
**Course Objectives:**

1. To introduce the basics of Earthquake Engineering
2. To introduce the engineering seismology, building geometrics & characteristics, structural irregularities,
3. To introduce tips on Earthquake Engineering - do's and don'ts
4. To introduce cyclic loading behaviour of RC, steel and pre-stressed concrete elements
5. To discuss code provisions and their application on different types of structures

**UNIT – I**

**Introduction to Structural Dynamics** : – Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Concept of response spectrum.

**UNIT – II**

**Multi-Degree of Freedom (MDOF) Systems** : - Formulation of equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

**UNIT – III**

**Earthquake Analysis** : - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and multi-storied buildings – Use of response spectra-Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion.

**UNIT – IV**

**Earthquake Engineering** : - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source, Focus, Epicenter etc – Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes – Seismic waves – Seismic zones – Seismic Zoning Map of India –

Seismograms and Accelograms-Review of the latest Indian Seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings – Beam, column and joints

**UNIT – V**

**Aseismic Planning** : - Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems – Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities – Vertical Geometric Irregularity – Proximity of Adjacent Buildings.

**Shear walls** : - Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements.

**TEXT BOOKS:**

1. Dynamics of Structures – Clough & Penzien, McGraw Hill – International Edition.
2. Earthquake Resistant Design of Structures by S.K.Duggal, Oxford University press, New Delhi
3. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch, Delhi.

**REFERENCES:**

1. Structural Dynamics by Mario Paaz , Academic Publishers.
2. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Prentice Hall of India, New Delhi
3. Earthquake Hazardous Mitigation by R.Ayothiraman and Hemanth Hazarika, I.K.International Publishing House Pvt.Ltd., New Delhi.

**Codes/Tables:**

**IS Codes:** IS:1893, IS:4326 and IS:13920 to be permitted into the examinations Hall.

**Course Outcomes:**

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

1. *apply the basics of Earthquake Engineering*
2. *demonstrate the dynamics of structural system under earthquake load*
3. *analyze the influence of the structural / geometrical design in building characteristics*
4. *demonstrate the cyclic loading behaviour of RC steel and pre-stressed concrete elements*
5. *apply codal provisions on different types of structures*

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**15A01710 REHABILITATION AND RETROFITTING OF STRUCTURES  
(CBCC - III)**

**Course Objectives:**

*This course introduces to the student the causes of concrete structures failures and methods available to rehabilitate and for retrofitting the structures with economical applications.*

**UNIT – I**

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage

**UNIT – II**

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.

**UNIT – III**

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

**UNIT – IV**

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting – Shot Create – Underpinning. Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

**UNIT – V**

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

**TEXT BOOKS:**

1. Concrete Technology by A.R. Santakumar, Oxford University press
2. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
3. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press

**REFERENCES**

1. Diagnosis And Treatment Of Structures In Distress By R.N.Raikar, Published By R&D Centre Of Structural Designers & Consultants Pvt.Ltd., Mumbai, 1994.
2. Handbook On Repair And Rehabilitation Of RCC Buildings, Published By CPWD, Delhi, 2002.
3. Earthquake Resistant Design Of Structures By Pankaj Agarwal And Manish Shrikhande, Prentice-Hall Of India, 2006.

**Course Outcomes:**

***After the completion of the course, the student will be able to***

1. *Assess the strength and materials deficiency in concrete structures*
2. *Suggest methods and techniques used in repairing / strengthening existing concrete structures*
3. *Apply Non Destructive Testing techniques to field problems*
4. *Apply cost effective retrofitting strategies for repairs in buildings*

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**15A01711 CAD LABORATORY****CAD:****SOFTWARE:**

1. STAAD PRO or Equivalent

**EXERCISIES:**

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple tower Analysis and Design
6. One Way Slab Analysis & Design
7. Two Way Slab Analysis & Design
8. Column Analysis & Design

**TEXT BOOK:**

1. Computer Aided Design Lab Manual by Dr.M.N.Sesha Prakash And Dr.C.S.Suresh

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0	0	4	2

**15A01712 ENVIRONMENTAL ENGINEERING LABORATORY****Course Objective:**

*The laboratory provides knowledge of estimating various parameters like PH, Chlorides, Sulphates, Nitrates in water. For effective water treatment, the determination of optimum dosage of coagulant and chloride demand are also included. The estimation status of Industrial effluents will also be taught in the laboratory by estimating BOD and COD of effluent.*

**LIST OF EXPERIMENTS**

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coliform test.

**NOTE:** At least 8 of the above experiments are to be conducted.

**LIST OF EQUIPMENT**

- 1) pH meter,
- 2) Turbidity meter,
- 3) Conductivity meter,
- 4) Hot air oven,
- 5) Muffle furnace,
- 6) Dissolved Oxygen meter,
- 7) U – V visible spectrophotometer,
- 8) Reflux Apparatus,
- 9) Jar Test Apparatus,
- 10) BOD incubator.
- 11) COD Extraction apparatus

**TEXT BOOKS:**

1. Chemistry for Environmental Engineering by Sawyer and Mc. Carty
2. Standard Methods for Analysis of water and Waste Water – APHA
3. Environmental Engineering Lab Manual by Dr.G.Kotaiah and Dr.N.Kumara Swamy, Charotar Publishers, Anand.

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3	1	0	3

**15A01801 URBAN TRANSPORTATION PLANNING  
(MOCS – II)**

**Course Objectives:** *This course aims to introduce the student to the basic concepts of urban transportation planning and various stages of planning such as trip generation, trip distribution, mode split and traffic assignment are dealt here. Concepts of economic evaluation of transportation plans are also introduced.*

**UNIT - I**

Concept of Travel Demand; Travel Characteristics - Origin, Destination, Route, Mode, Purpose; Travel Demand as a function of independent variables; Assumptions in Demand Estimation Relation between land use and Travel.

**UNIT - II**

Transportation Planning process; General concept of Trip; Four step process of Transportation planning-Aggregate and disaggregate Models. Delineation of study area; Zoning Principles; Formation of TAZs; Types and sources of Data, Home Interview surveys; Road side interview surveys; Goods. Taxi, IPT surveys; sampling techniques; Expansion factors and accuracy check; Desire line diagram and use.

**UNIT - III**

**Trip Generation:** Factors governing Trip Generation and Attraction; Multiple Linear Regression Models, Category Analysis.

**Trip Distribution:** Methods of Trip Distribution; Growth Factor Models Uniform Growth Factor Method; Average Growth Factor Method; Fratar Method; Advantages and limitations of Growth Factor Models; concept of Gravity Model(Elementary Concept Only).

**UNIT -IV**

**Mode Split:** Factors affecting mode split; Logit Model.

**Traffic assignment:** Purpose of Assignment and General Principles; Minimum path trees; Assignment Techniques - All - or- nothing Assignment; Capacity restraint Assignment; diversion curves.



**UNIT - V**

Economic Evaluation of Transportation plans; Costs and benefits of transportation projects; vehicle operating cost; Time savings; Accident costs. Methods of Economic Evaluation - Benefit cost Ratio Method; Net present value method; Internal Rate of Return method.

**TEXT BOOKS:**

1. Traffic Engineering and Transportation Planning by L.R.Kadiyali, Khanna Publishers, Delhi.
2. Fundamentals of Transportation Engineering by Papa Costas C.S., Prentice Hall, India.
3. Transportation Engineering -An Introduction by Khisty C.J, Prentice Hall.

**Course Outcomes:**

*On completion of this course the student will be able to*

1. *Understand the concept of Travel Demand and the factors affecting it*
2. *Understand the different stages of Urban Transportation Planning and the mathematical models associated with each stage*
3. *Assess the economic impact of new Transportation plans*

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**15A01802    ADVANCED STRUCTURAL ENGINEERING  
(MOCS – II)**

**Course Objective:** *To make the student more conversant with the design principles of multistoried buildings, roof system, foundation and other important structures.*

1. Design of a flat slab ( Interior panel only )
2. Design of concrete bunkers of circular shape – (excluding staging) – ntroduction to silos
3. Design of concrete chimney
4. Design of circular and rectangular water tank resting on the ground
5. Design of cantilever and counter forte retaining wall with horizontal back fill

**FINAL EXAMINATION PATTERN:**

The question paper shall contain 2 questions of either or type covering all the syllabus where each question carries 35 marks out of 35 marks, 20 marks shall be for the design and 15 marks are for the drawing.

**TEXT BOOKS :-**

1. Structural Design And Drawing (RCC And Steel) By Krishnam Raju, Universites .Press , New Delhi
2. R.C.C Structures By [Dr. B. C. Punmia](#), [Ashok Kumar Jain](#), [Arun Kumar Jain](#), Laxmi Publications, New Delhi

**Reference Books :-**

1. Design Of RCC Structures By M.L.Gambhir P.H.I. Publications, New Delhi.
2. Advanced RCC By P.C. Varghese , PHI Publications, New Delhi.
3. R.C.C Designs By Sushil Kumar , Standard Publishing House.
4. Fundamentals Of RCC By N.C.Sinha And S.K.Roy, S.Chand Publications, New Delhi.

**Course Outcomes:**

*On completion of this course the student will be able to*

1. *Design of roof systems with reference to Indian standards*
2. *Design of water retaining and storage structures*
3. *Design of silos and chimneys*

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15A01803

**PRESTRESSED CONCRETE  
(MOCS – III )**

**Course Objectives:**

*To introduce the need for prestressing as well as the methods, types and advantages of prestressing to the students. Students will be introduced to the design of prestressed concrete structures subjected to flexure and shear.*

**UNIT – I**

**INTRODUCTION:**

Historic development – General principles of Prestressing, Pretensioning And Post Tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics.

**METHODS OF PRESTRESSING:-**

Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System, Freyssinet system and Gifford – Udall System.

**UNIT – II**

**LOSSES OF PRESTRESS:-**

Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of stress in steel, slip in anchorage, bending of member and wobble frictional losses.

**UNIT – III**

**ANALYSIS & DESIGN OF SECTIONS FOR FLEXURE:-**

Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons. Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure – Kern – lines, cable profile.

**UNIT – IV**

**DESIGN OF SECTION FOR SHEAR :**

Shear and Principal Stresses – Design for Shear in beams.

**COMPOSITE SECTION:**

Introduction – Analysis of stress – Differential shrinkage – General design considerations.

**UNIT – V****DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS:**

Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members prediction of long term deflections.

**TEXT BOOKS:**

- 1 Prestressed Concrete by N. Krishna Raju; - Tata Mc.Graw Hill Publications.
- 2 Prestressed Concrete by K.U.Muthu, PHI Publications.
- 3 Prestressed Concrete by Ramamrutham, Dhanpatrai Publications

**REFERENCE:**

1. Prestressed Concrete Design By Praveen Nagrajan, Pearson Publications, 2013 Editions.
2. Design Of Prestressed Concrete Structures (Third Edition) By T.Y. Lin & Ned H. Burns, John Wiley & Sons.
3. Prestressed Concrete By Pandit.G.S. And Gupta.S.P., CBS Publishers And Distributers Pvt. Ltd, 2012.
4. Prestressed Concrete By Rajagopalan.N, Narosa Publishing House, 2002.
5. Prestressed Concrete Structures By Dayaratnam.P., Oxford And IBH, 2013

**Codes/Tables:**

**Codes:** BIS code on prestressed concrete, IS 1343 to be permitted into the examination Hall.

**Course Outcomes:**

*Student shall have knowledge on*

1. Methods of prestressing and able to design various prestressed concrete structural elements.
2. Analysis of sections to withstand shear and flexure.

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**15A01804 ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT  
(MOOCS – III)**
**Course Objective:**

*This subject deals with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same. The student is able to know about the various impacts of development projects on environment and the mitigating measures.*

**UNIT – I**
**INTRODUCTION:-**

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

**UNIT – II**
**EIA METHODOLOGIES:-**

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

**UNIT – III**
**IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE:-**

Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

**UNIT – IV**
**ASSEMENT OF IMPACT ON VEGETATION AND WILDLIFE :**

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

**ENVIRONEMNTAL AUDIT :**

Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

**UNIT-V****ENVIRONMENTAL ACTS (PROTECTION AND PREVENTION)**

Post Audit activities, The Environmental protection Act, The water prevention Act, The Air (Prevention & Control of pollution Act.), Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

**TEXT BOOKS:**

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

**REFERENCES:**

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K., Katari & Sons Publication., New Delhi.
2. Environmental science and Engineering by Aloka Debi, Universities Press.
3. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi
4. Environmental Impact Assessment, Canter, L.W., 1977, McGraw Hills, New York.
5. John G. Rau and David C. Wooten (Ed), Environmental Impact Analysis Handbook, McGraw Hill Book Company.

**Course Outcomes:**

*On completion of this course the student will be able to*

1. *Perform a critical quality review of an EIA and EIS;*
2. *Structure the EIA working process considering the need for interdisciplinarity;*
3. *Perform the screening and scoping of an EIA, based on existing requirements, evaluate the impacts and draw meaningful conclusions from the results of the EIA;*
4. *Clarify the concept of EIA and its application in an international context to those involved in or affected by the EIA process;*
5. *Interpretate an EIA, present its conclusions and translate its conclusions into actions.*