

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
(Established by Govt. of A.P., ACT No.30 of 2008)  
**ANANTAPUR – 515 002 (A.P) INDIA**

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**Lr.No.JNTUA/DAPO/A1/I B.Tech I sem syllabus/2015      Date:27/06/2015**

Sub:- JNTUA – DAPO – B.Tech (R15) – 1<sup>st</sup> year I semester course structure  
& syllabus-Reg.

Ref:- Note Orders of the Vice-Chancellor, dated:-27-06-2015.

\* \* \*

Vide ref cited above, I am herewith enclosing approved course structure & syllabi of I B.Tech I semester of R15 regulations which is applicable for the students admitted from 2015-16 onwards.

S.No.	Code No	Title of the Subject
1	15A52101	Functional English
2	15A54101	Mathematics – I
3	15A56101	Engineering Physics
4	15A05101	Computer Programming
5	15A03101	Engineering Drawing
6	15A51101	Engineering Chemistry
7	15A01101	Environmental Studies
8	15A52102	English Language Communication Skills Lab
9	15A56102	Engineering Physics Lab
10	15A51102	Engineering Chemistry Lab
11	15A05102	Computer Programming Lab

Yours faithfully,

**D.A.P**



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**Course Structure for B.Tech. - R15 Regulations**  
**Common to CSE/EEE/CE**

**I B.Tech. - I Semester**

S.No	Course code	Subject	Theory	Tu / Drg / Lab	Credits
1.	15A52101	Functional English	3	1 - -	3
2.	15A54101	Mathematics – I	3	1 - -	3
3.	15A05101	Computer Programming	3	1 - -	3
4.	15A56101	Engineering Physics	3	1 - -	3
5.	15A03101	Engineering Drawing	0	- 6 -	3
6.	15A52102	English Language Communication Skills Lab	-	- - 4	2
7.	15A56102	Engineering Physics Lab	-	- - 4	2
8.	15A05102	Computer Programming Lab	-	- - 4	2
					21

For the subject Engineering Drawing, day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2hrs each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 15 marks, any fraction shall be rounded off to the next higher mark. There shall be no objective paper in internal examination. The sum of day to day evaluation and the internal test marks will be the final sessional marks for the subject.

In the end examination pattern for Engineering Drawing there shall be 5 questions, either-or type, of 14 marks each. There shall be no objective type questions in the end examination.



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**Course Structure for B.Tech. - R15 Regulations**  
**Common to ECE/ME/EIE/IT**

**I B.Tech. - I Semester**

S.No	Course code	Subject	Theory	Tu / Lab	Credits
1.	15A52101	Functional English	3	1 -	3
2.	15A54101	Mathematics – I	3	1 -	3
3.	15A05101	Computer Programming	3	1 -	3
4.	15A51101	Engineering Chemistry	3	1 -	3
5.	15A01101	Environmental Studies	3	1 -	3
6.	15A52102	English Language Communication Skills Lab	-	- -	2
7.	15A51102	Engineering Chemistry Lab	-	- -	2
8.	15A05102	Computer Programming Lab	-	- -	2
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I B.Tech. I - Semester

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<b>3</b>	<b>1</b>	<b>3</b>

**(15A52101) FUNCTIONAL ENGLISH**  
**(Common to All Branches)**

**Preamble:**

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career, better pay, and advanced knowledge and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**Objectives:**

- To enable the students to communicate in English for academic and social purpose.
- To enable the students to acquire structure and written expressions required for their profession.
- To develop the listening skills of the students.
- To inculcate the habit of reading and critical thinking skills.
- To enhance the study skills of the students with emphasis on LSRW skills.

**UNIT –I**

**Topics:** Paragraph writing, writing letters, role play, reading graphs, prepositions, designing posters, tenses, making recommendations.

**Text:** ENVIRONMENTAL CONSCIOUSNESS' from *MINDSCAPES*  
Climate Change - Green Cover – Pollution

**UNIT –II**

**Topics:** Compound nouns, imperatives, writing instructions, interpreting charts and pictures, note making, role play, prefixes, subject-verb agreement.

**Text:** EMERGING TECHNOLOGIES from *MINDSCAPES*  
Solar Thermal Power - Cloud Computing - Nanotechnology

**UNIT –III**

**Topics:** Making conversations, homonyms and homophones, SMS and use of emotions, past participle for irregular verbs, group discussion, E - mail communication, antonyms, Preparing projects

**Text:** GLOBAL ISSUES from *MINDSCAPES*  
Child Labour - Food Crisis - Genetic Modification - E-Waste - Assistive Technology

#### **UNIT –IV**

**Topics:** Group discussion, affixes, double consonants, debates, writing a book / film review, predicting and problem-solving-future tense, adverbs

**Text:** SPACE TREK from *MINDSCAPES*

Hubble Telescope - Chandrayan-2 - Anusat - Living Quarters - Space Tourism

#### **UNIT –V**

**Topics:** Compare and contrast, effective writing, group discussion, writing reports, writing advertisements, tweeting and blogging, types of interviews, framing questions.

**Text:** MEDIA MATTERS from *MINDSCAPES*

History of Media - Language and Media - Milestone in Media - Manipulation by Media - Entertainment Media - Interviews

#### **Text Books:**

1. *MINDSCAPES: English for Technologists and Engineers*, Orient Blackswan, 2014.

#### **References:**

1. *A Practical Course in Effective English Speaking Skills* by J.K.Gangal, PHI Publishers, New Delhi.2012
2. *Technical Communication*, Meenakshi Raman, Oxford University Press,2011.
3. *Spoken English*, R.K. Bansal & JB Harrison, Orient Longman,2013, 4<sup>th</sup> edition.
4. *Murphy's English Grammar with CD*, Murphy, Cambridge University Press,3<sup>rd</sup> edition.
5. *An Interactive Grammar of Modern English*, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO,2008.

#### **Outcomes:**

- Have improved communication in listening, speaking, reading and writing skills in general.
- Have developed their oral communication and fluency in group discussions and interviews.
- Have improved awareness of English in science and technology context.
- Have achieved familiarity with a variety of technical reports.

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I B.Tech. - I Semester

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(15A54101) MATHEMATICS – I  
(Common to All Branches)

**Objectives:**

- To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary differential equations and vector calculus.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.

**UNIT – I**

Exact, linear and Bernoulli equations, Applications to first order equations; Orthogonal trajectories, Simple electric circuits.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax} V(x)$ ,  $xV(x)$ .

**UNIT – II**

Method of variation of parameters, linear equations with variable coefficients: Euler-Cauchy Equations, Legendre's linear equation. Applications of linear differential equations- Mechanical and Electrical oscillatory circuits and Deflection of Beams.

**UNIT – III**

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature.

**UNIT – IV**

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes in Cartesian and polar coordinates using double and triple integral.

**UNIT – V**

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

**Text Books:**

1. Engineering Mathematics-I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher
2. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

**References:**

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

**Outcomes:**

- The students become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems.
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

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(15A05101) COMPUTER PROGRAMMING  
(Common to All Branches)

**Objectives:**

- Understand problem solving techniques
- Understand representation of a solution to a problem
- Understand the syntax and semantics of C programming language
- Understand the significance of Control structures
- Learn the features of C language

**UNIT - I**

Overview of Computers and Programming - Electronic Computers Then and Now - Computer Hardware - Computer Software - Algorithm - Flowcharts - Software Development Method - Applying the Software Development Method.

Types, Operators and Expressions: Variable Names - Data Types and Sizes - Constants - Declarations - Arithmetic Operators - Relational and Logical Operators - Type Conversions - Increment and Decrement Operators - Bitwise Operators - Assignment Operators and Expressions - Conditional Expressions - Precedence and Order of Evaluation.

**UNIT - II**

Selections Statements – Iteration Statements – Jump Statements- Expression Statements - Block Statements.

Single Dimensional Arrays – Generating a Pointer to an Array – Passing Single Dimension Arrays to Functions – Strings – Two Dimensional Arrays – Indexing Pointers – Array Initialization – Variable Length Arrays

**UNIT - III**

Pointer Variables – Pointer Operators - Pointer Expressions – Pointers And Arrays – Multiple Indirection – Initializing Pointers – Pointers to Functions – C's Dynamic Allocation Functions – Problems with Pointers.

Understanding the scope of Functions – Scope Rules – Type Qualifiers – Storage Class Specifiers- Functions Arguments –The Return Statement.

**UNIT - IV**

Command line arguments – Recursion – Function Prototypes – Declaring Variable Length Parameter Lists

Structures – Arrays of Structures – Passing Structures to Functions – Structure Pointers – Arrays and Structures within Structures – Unions – Bit Fields – Enumerations – typedef

**UNIT - V**

Reading and Writing Characters – Reading and Writing Strings – Formatted Console I/O – Printf - Scanf – Standard C Vs Unix File I/O – Streams and Files – File System Basics – Fread and Fwrite – Fseek and Random Access I/O – Fprintf ( ) and Fscanf( ) – The Standard Streams – The Preprocessor Directives #define and #include.

**Text Books:**

1. “The Complete Reference C”- Fourth Edition- Herbert Schildt- McGrawHill Education.
2. “The C Programming Language” Second Edition- Brain W. Kernighan- Dennis M. Ritchie- Prentice Hall-India. (UNIT- I)

**References:**

1. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
2. “C From Theory to Practice”- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
3. “Programming with C”- R S Bichkar- University Press.

4. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)
5. Computer Fundamentals and C Programming- Second Edition- P.Chenna Reddy- Available at Pothi.com (<http://pothi.com/pothi/book/dr-p-chenna-reddy-computer-fundamentals-and-c-programming>).

**Outcomes:**

- Apply problem solving techniques in designing the solutions for a wide-range of problems
- Choose appropriate control structure depending on the problem to be solved
- Modularize the problem and also solution

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I B.Tech. I - Semester

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(15A56101) ENGINEERING PHYSICS  
(Common to CSE/EEE/CIVIL)

**Objectives:**

- To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity, classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.
- To open new avenues of knowledge and understanding semiconductor based electronic devices, basic concepts and applications of semiconductors and magnetic materials have been introduced which find potential in the emerging micro device applications.
- To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in emerging technologies are elicited.

**UNIT - I**

**PHYSICAL OPTICS, LASERS AND FIBRE OPTICS**

*Physical Optics:* Interference (Review) – Interference in thin film by reflection – Newton's rings – Diffraction (Review) - Fraunhofer diffraction due to single slit, double slit and diffraction grating.

*Lasers:* Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients — Population inversion – Excitation mechanism and optical resonator – Nd:YAG laser - He-Ne laser – Semiconductor Diode laser - Applications of lasers

*Fiber optics:* Introduction - construction and working principle of optical fiber – Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in Optical fibers – Block diagram of Optical fiber communication system – Applications of optical fibers

**UNIT – II**

**CRYSTALLOGRAPHY AND ULTRASONICS**

*Crystallography:* Introduction – Space lattice – Unit cell – Lattice parameters – Bravais lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law – Powder method.

*Ultrasonics:* Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

**UNIT – III**

**QUANTUM MECHANICS AND ELECTRON THEORY**

*Quantum Mechanics:* Matter waves – de Broglie hypothesis and properties - Schrodinger's time dependent and independent wave equations – Physical significance of wave function - Particle in one dimensional infinite potential well.

*Electron theory:* Classical free electron theory – Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution – Source of electrical resistance – Kronig-Penny model (qualitative treatment) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

## UNIT – IV

### SEMICONDUCTORS AND MAGNETIC MATERIALS

*Semiconductors:* Intrinsic and extrinsic semiconductors (Qualitative treatment) – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Formation of p-n junction.

*Magnetic materials:* Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials (Qualitative treatment) – Hysteresis - Soft and hard magnetic materials, applications of magnetic materials.

## UNIT – V

### SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS

*Superconductivity:* Introduction - Effect of magnetic field - Meissner effect – Type I and Type II superconductors – Flux quantization – Penetration depth - BCS theory (qualitative treatment) – Josephson effects – Applications of superconductors.

*Physics of Nanomaterials:* Introduction - Significance of nanoscale and types of nanomaterials – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches: ball mill, chemical vapour deposition, and sol gel – Applications of nanomaterials.

#### Text Books:

1. Engineering Physics – K.Thyagarajan, 5<sup>th</sup> Edition, MacGraw Hill Publishers, NewDelhi, 2014.
2. Physics for Engineers - N.K Verma, 1<sup>st</sup> Edition, PHI Learning Private Limited, New Delhi, 2014.

#### References:

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10<sup>th</sup> Edition, S.Chand and Company, New Delhi, 2014.
2. Engineering Physics – D K Pandey, S. Chaturvedi, 2<sup>nd</sup> Edition, Cengage Learning, New Delhi, 2013.
3. Engineering Physics – D.K Bhattacharya, Poonam Tandon, 1<sup>nd</sup> Edition, Oxford University Press, New Delhi, 2015.

#### Outcomes:

- The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.
- The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.
- The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
- The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.
- The properties and device applications of semiconducting and magnetic materials are illustrated.
- The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.

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(15A03101) ENGINEERING DRAWING  
(Common to CSE/EEE/CIVIL)

**Objectives:**

- To gain and understanding of the basics of geometrical constructions of various planes and solids, understanding system of graphical representation of various objects and various views to draft and read the products to be designed and eventually for manufacturing applications.
- To learn about various projections, to understand complete dimensions and details of object.
- Ultimately student must get imaginary skill to put an idea of object, circuit, assembly of parts in black & white, to design a product and to understand the composition, which can be understood universally.

**UNIT I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance- Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Conic Sections including the Rectangular Hyperbola- General method only, b) Cycloid, Epicycloid and Hypocycloid

**UNIT II**

**Scales:** Plain, Diagonal and Vernier;

**Projection of Points:** Principles of orthographic projection – Convention – First angle projections, projections of points.

**UNIT III**

**Projections of Lines:** lines inclined to one or both planes, Problems on projections, Finding True lengths.

**Projections of Planes:** Projections of regular plane surfaces- plane surfaces inclined to both planes.

**UNIT IV**

**Projections of Solids:** Projections of Regular Solids with axis inclined to both planes.

**Developments of Solids:** Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

**UNIT V**

**Isometric and Orthographic Projections:** Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

**Text Books:**

1. *Engineering Drawing*, N.D. Bhatt, Charotar Publishers
2. *Engineering Drawing*, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai

**References:**

1. *Engineering Drawing*, Johle, Tata McGraw-Hill Publishers
2. *Engineering Drawing*, Shah and Rana, 2/e, Pearson Education
3. *Engineering Drawing and Graphics*, Venugopal/New age Publishers
4. *Engineering Graphics*, K.C. John, PHI, 2013
5. *Engineering Drawing*, B.V.R. Guptha, J.K. Publishers

**Outcomes:**

- Drawing 2D and 3D diagrams of various objects.
- Learning conventions of Drawing, which is an Universal Language of Engineers.
- Drafting projections of points, planes and solids.

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**(15A51101) ENGINEERING CHEMISTRY  
(Common to ECE/EIE/ME/IT)**

**Objectives:**

- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand the concepts of chemistry and apply to various materials for engineering applications.

**UNIT – I WATER QUALITY AND TREATMENT**

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water:

For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.

Demineralisation of brackish water: Reverse Osmosis and Electrodialysis

**UNIT – II POLYMERS**

i) Introduction: Basic concepts of polymerisation, Types of polymerisation (Chain Growth (Addition), Step growth (Condensation)), Mechanism: cationic, anionic, free radical and coordination covalent.

Plastomers: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Teflon, Bakelite and nylons.

Elastomers

Natural Rubber; Processing of natural rubbers, Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, Buna-N, Polyurethane, Polysulfide (Thiokol) rubbers

ii) Conducting polymers: Mechanism, synthesis and applications of polyacetylene, polyaniline.

iii) Inorganic Polymers: Basic Introduction, Silicones, Polyphosphazins  $(-R)_2-P=N-$  applications

**UNIT – III ELECTROCHEMISTRY**

i) Galvanic cells, Nernst Equation, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen, Solid oxide)

ii) Corrosion: Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion. Galvanic series, factors affecting the

corrosion (Metal and environment). Prevention: Cathodic protection (Sacrificial anode and impressed current), Inhibitors (Anodic and cathodic), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel)

#### **UNIT – IV FUELS AND COMBUSTION**

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels: Coal-Classification and Analysis (proximate and ultimate), Coke :Characteristics of metallurgical coke, Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline- Octane Number, Diesel -Cetane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Natural gas, Producer gas, Water gas, Coal gas and Biogas. Determination calorific value of Gases fuels by Junker's calorimeter.

Combustion: Basic principles and numerical problems, Flue Gas analysis by Orsat's apparatus.

#### **UNIT – V CHEMISTRY OF ENGINEERING MATERIALS**

i) Cement: Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening (Hydration and Hydrolysis)

ii) Refractories: Introduction, Classification , properties and applications

iii) Lubricants: Introduction, classification (Solid, liquid, semi solid, emulsion and synthetic), Theory of lubrication (Thin film, Thick film & Extreme pressure) , properties of lubricants and applications.

iv) Carbon clusters: Fullerenes and Carbon Nano Tubes (CNT)

#### **Text Books:**

1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GV and Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.
2. A Text Book of Engineering Chemistry, 15<sup>th</sup> Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

#### **References:**

1. A Text book of Engineering Chemistry, 12<sup>th</sup> Edition, SS Dhara, Uma, S. Chand Publications, New Delhi, 2010.
2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010.
3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

**Outcomes:** The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.

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(15A01101) ENVIRONMENTAL STUDIES  
(Common to ECE/EIE/ME/IT)

**Objectives:**

To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

**UNIT – I**

**MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:** – Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**SOLID WASTE MANAGEMENT:** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

#### **UNIT – IV**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

#### **UNIT – V**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

#### **Text Books:**

1. Text Book of Environmental Studies for Undergraduate Courses, Erach Bharucha, Universities Press Pvt Ltd, Hyderabad. 2<sup>nd</sup> Edition 2013.
2. Environmental Studies by Kaushik, New Age PUBLISHERS.

#### **References:**

1. Environmental Studies by Rajagopalan, Oxford Publishers.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

#### **Outcomes:**

- Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
- Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
- By studying environmental sciences, students are exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
- At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

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**I B.Tech. I - Semester**

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**(15A52102) ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB  
(Common to All Branches)**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

**Objectives:**

- To enable students to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

**UNIT - 1**

1. Phonetics -importance
2. Introduction to Sounds of Speech
3. Vowels and consonants sounds
4. Phonetic Transcription

**UNIT - II**

5. Word Stress
6. Syllabification
7. Rules of word stress
8. Intonation

**UNIT - III**

9. Situational Dialogues
10. Role Plays
11. JAM
12. Describing people/objects/places

**UNIT - IV**

13. Debates
14. Group Discussions
15. Interview skills

**UNIT - V**

16. Video speech writing
17. Book reviews -oral and written



### **Minimum Requirements for ELCS Lab:**

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

### **Suggested Software:**

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. Walden InfoTech Software.

### **References:**

1. A Textbook of English Phonetics for Indian Students 2<sup>nd</sup> Ed T. Balasubramanian. (Macmillan),2012.
2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. Speaking English Effectively, 2<sup>nd</sup> Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011
5. Spring Board Success, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderabad, 2010.

### **Outcomes:**

- Become active participants in the learning process and acquire proficiency in spoken English.
- Speak with clarity and confidence thereby enhance employability skills.

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**(15A56102) ENGINEERING PHYSICS LABORATORY  
(Common to CSE/EEE/CIVIL)**

**Objectives:**

- Will recognize the important of optical phenomenon like Interference and diffraction.
- Will understand the role of optical fiber parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor
- Will understand the applications of B H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms of lattice constant.
- Will recognize the application of laser in finding the particle size and its role in diffraction studies.
- Will learn to synthesis of the nanomaterials and recognize its importance by knowing its nano particle size and its impact on its properties.

**Any 10 of the following experiments has to be performed during the I year I semester**

1. Determination of radius of curvature of a Plano-convex lens by forming Newton's rings.
2. Determination of wavelength of given source using diffraction grating in normal incidence method.
3. Determination of Numerical aperture, acceptance angle of an optical fiber.
4. Energy gap of a Semiconductor diode.
5. Hall effect – Determination of mobility of charge carriers.
6. B-H curve – Determination of hysteresis loss for a given magnetic material.
7. Determination of Crystallite size using X-ray pattern (powder) using debye-scheerer method.
8. Determination of particle size by using laser source.
9. Determination of dispersive power of a prism.
10. Determination of thickness of the thin wire using wedge Method.
11. Laser : Diffraction due to single slit
12. Laser : Diffraction due to double slit
13. Laser: Determination of wavelength using diffraction grating
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
15. Synthesis of nanomaterial by any suitable method.

**References:**

1. Engineering Physics Practicals – NU Age Publishing House, Hyderabad.
2. Engineering Practical physics – Cengage Learning, Delhi.

**Outcomes:**

- Would recognize the important of optical phenomenon like Interference and diffraction.
- Would have acquired the practical application knowledge of optical fiber, semiconductor, dielectric and magnetic materials, crystal structure and lasers by the study of their relative parameters.
- Would recognize the significant importance of nanomaterials in various engineering fields.

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(15A51102) ENGINEERING CHEMISTRY LAB  
(Common to ECE/EIE/ME/IT)

**Objectives:**

- Will learn practical understanding of the redox reaction
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
- Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

**List of Experiments:**

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Alkalinity of Water
6. Determination of acidity of Water
7. Preparation of Phenol-Formaldehyde (Bakelite)
8. Determination of Viscosity of oils using Redwood Viscometer I
9. Determination of Viscosity of oils using Redwood Viscometer II
10. Determination of calorific value of gaseous fuels by Junker's Calorimeter
11. Conductometric estimation of strong acid using standard sodium hydroxide solution
12. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
13. Potentio metric determination of iron using standard potassium dichromate
14. Colorometric estimation of manganese.
15. pH meter calibration and measurement of pH of water and various other samples.

(Any 10 experiments from the above list)

**References:**

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

**Outcomes:**

- Would be confident in handling energy storage systems and would be able combat chemical corrosion
- Would have acquired the practical skill to handle the analytical methods with confidence.
- Would feel comfortable to think of design materials with the requisite properties
- Would be in a position to technically address the water related problems.

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(15A05102) COMPUTER PROGRAMMING LAB  
(Common to All branches)

**Objectives:**

- Learn C Programming language
- To make the student solve problems, implement algorithms using C language.

**List of Experiments/Tasks**

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, To read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a Quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.
13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms e  
$$x=1+x+x^2/2!+x^3/3!+x^4/4!+-----$$
16. Write a program to generate Pascal Triangle.
17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
  - i. Find the sum of Diagonal Elements of a matrix.
  - ii. Print Transpose of a matrix.
  - iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.
20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.
21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
23. Write a program to merge two files.
24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
25. Write a program to read a set of strings and sort them in alphabetical order.

26. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
  - i. String length determination
  - ii. Compare Two Strings
  - iii. Concatenate them, if they are not equal
  - iv. String reversing
27. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.
28. Write a program to exchange two numbers using pointers.
29. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
30. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
31. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.
32. Write a program to find the square root of a number without using built-in library function.
33. Write a program to convert from string to number.
34. Write a program to implement pseudo random generator.
35. Write a program to generate multiplication tables from 11 to 20.
36. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.
37. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
38. Write a program to find the execution time of a program.
39. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

**Note:**

1. Instructors are advised to conduct the lab in LINUX/UNIX environment also
2. The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in Theory. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.

**References:**

1. "How to Solve it by Computer", R.G. Dromey, Pearson.
2. "The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. "Let us C", Yeswant Kanetkar, BPB publications
4. "Pointers in C", Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

**Outcomes:**

- Apply problem solving techniques to find solutions to problems
- Able to use C language features effectively and implement solutions using C language.
- Improve logical skills.



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**Course Structure for B.Tech. - R15 Regulations**

**CIVIL ENGINEERING**

**I-II Semester**

S.No	Course code	Subject	Th	Tu/Drg/Lab	Credits
1.	15A52201	English for Professional Communication	3	1 - -	3
2.	15A54201	Mathematics – II	3	1 - -	3
3.	15A01201	Engineering Mechanics	3	1 - -	3
4.	15A51101	Engineering Chemistry	3	1 - -	3
5.	15A01101	Environmental Studies	3	1 - -	3
6.	15A01202	Applied Mechanics Lab	-	- - 4	2
7.	15A51102	Engineering Chemistry Lab	-	- - 4	2
8.	15A99201	Engineering & IT Workshop	-	- - 4	2
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**B.Tech. I - II Sem. (CE)**

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<b>3</b>	<b>1</b>	<b>3</b>

**(15A52201) ENGLISH FOR PROFESSIONAL COMMUNICATION**

**1. INTRODUCTION:**

English is a global language and has international appeal and application. It is widely used in a variety of contexts and for varied purposes. The students would find it useful both for social and professional development. There is every need to help the students acquire skills useful to them in their career as well as workplace. They need to write a variety of documents and letters now extending into professional domain that cuts across business and research also. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**2. OBJECTIVES:**

1. To develop confidence in the students to use English in everyday situations.
2. To enable the students to read different discourses so that they appreciate English for science and technologies.
3. To improve familiarity with a variety of technical writings.
4. To enable the students to acquire structure and written expressions required for their profession.
5. To develop the listening skills of the students.

**3. SYLLABUS:**

**UNIT -I**

**Topics:** Group discussion, cause and effect, events and perspectives, debate, if conditional, essay writing.

**Text: LESSONS FROM THE PAST** from *MINDSCAPES*

Importance of History - Differing Perspectives - Modern Corporatism -  
Lessons From The Past

## **UNIT-II**

**Topics:** Idioms, essay writing, power point presentation, modals, listening and rewriting, preparing summary, debate, group discussion, role play, writing a book review, conversation

**Text: 'ENERGY' from *MINDSCAPES***

Renewable and Non-Renewable Sources - Alternative Sources -Conservation -Nuclear Energy

## **UNIT-III**

**Topics:** Vocabulary, impromptu speech, creative writing, direct and indirect speech, fixed expressions, developing creative writing skills, accents, presentation skills, making posters, report writing

**Text: 'ENGINEERING ETHICS' from *MINDSCAPES***

Challenger Disaster - Biotechnology - Genetic Engineering - Protection From Natural Calamities

## **UNIT-IV**

**Topics:** Vocabulary, Conversation, Collocation, Group discussion, Note-making, Clauses, Interpreting charts and tables, Report writing.

**Text: 'TRAVEL AND TOURISM' from *MINDSCAPES***

Advantages and Disadvantages of Travel - Tourism - Atithi Devo Bhava - Tourism in India

## **UNIT-V**

**Topics:** Vocabulary, phrasal verbs, writing a profile, connectives, discourse markers, problem-solving, telephone skills, application letters, curriculum vitae, interviews (telephone and personal)

**Text: 'GETTING JOB-READY' from *MINDSCAPES***

SWOT Analysis - Companies And Ways Of Powering Growth - Preparing For Interviews

### **Prescribed Text**

***MINDSCAPES*:** English for Technologists and Engineers, Orient Blackswan, 2014.



## **REFERENCES:**

1. **Effective Tech Communication**, Rizvi, Tata McGraw-Hill Education, 2007.
2. **Technical Communication**, Meenakshi Raman, Oxford University Press.
3. **English Conversations Practice**, Grant Taylor, Tata Mc GrawHill publications, 2013.
4. **Practical English Grammar**. Thomson and Martinet, OUP, 2010.

## **Expected Outcomes:**

At the end of the course, students would be expected to:

1. Have acquired ability to participate effectively in group discussions.
2. Have developed ability in writing in various contexts.
3. Have acquired a proper level of competence for employability.

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**(15A54201) MATHEMATICS – II  
(Common to All Branches)**

**Objectives:** Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and solution of partial differential equations.

**UNIT – I**

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

**UNIT – II**

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions- Parseval's formula- Complex form of Fourier series.

**UNIT – III**

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

**UNIT – IV**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

**UNIT – V**

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

**TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

**REFERENCES:**

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:**The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.

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**(15A01201) ENGINEERING MECHANICS**

**OBJECTIVE:** This course will serve as a basic course by introducing the concepts of basic mechanics which will help as a foundation to various courses.

**UNIT - I**

**INTRODUCTION OF ENGINEERING MECHANICS** - Basic concepts - System of Forces - Moment of Forces and its Application - Couples and Resultant of Force System - Equilibrium of System of Forces - Degrees of Freedom - Free body diagrams -Types of Supports - Support reactions for beams with different types of loading - concentrated, uniformly distributed and uniformly varying loading.

**UNIT - II**

**FRICTION** : Types of friction- laws of Friction - Limiting friction- Cone of limiting friction- static and Dynamic Frictions - Motion of bodies - Wedge, Screw jack and differential Screw jack.

**UNIT - III**

**CENTROID AND CENTER OF GRAVITY:** Centroids of simple figures - Centroids of Composite figures - Centre of Gravity of bodies - Area moment of Inertia - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures.

**MASS MOMENT OF INERTIA:** Moment of Inertia of Simple solids - Moment of Inertia of composite masses.( Simple problems only)

**UNIT - IV**

**KINEMATICS:** Rectilinear and Curvilinear motion - Velocity and Acceleration - Motion of A Rigid Body - Types and their Analysis in Planar Motion.

**KINETICS** : Analysis as a particle and Analysis as a Rigid Body in Translation - Central Forces of motion - Equations of Plane Motion - Fixed Axis Rotation - Rolling Bodies - Work Energy Method - Equation for

Translation – Work Energy application to Particle Motion, Connection System – Fixed axis Rotation and Plane Motion.

### **UNIT – V**

**ANALYSIS OF PERFECT FRAMES:** Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

**MECHANICAL VIBRATIONS:** Definitions, Concepts-Simple Harmonic motion-Free vibrations-Simple Compound and Torsional pendulum-Numerical problems

### **TEXT BOOKS:**

- (1) Engineering Mechanics by Dr.R.k.Bansal, Lakshmi Publications.
- (2) Engineering Mechanics by Shames & Rao – Pearson Education.

### **REFERENCES:**

- (1) Engineering Mechanics by Bhavakatti, New age publishers
- (2) Engineering Mechanics by Seshigiri Rao, Universities Press, Hyderabad.
- (3) Engineering Mechanics – B. Bhattacharyya, Oxford University Publications.

### **Outcomes**

On successful completion of the course, the subject knowledge will be able to

1. Develop students to acquire knowledge of static and dynamic behavior of the bodies.
2. Develop students to acquire the knowledge, so that they can understand physical phenomenon with the help of various theories.
3. Develop students, who will be able to explain the physical phenomenon with help of diagrams.
4. Develop students with a broad vision with the skills of visualizing and developing their own ideas, and to convert those ideas into engineering problems and solving those problems with the acquired knowledge of the Engineering Mechanics.

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**(15A51101) ENGINEERING CHEMISTRY  
(Common to All Branches)**

**Objectives:**

- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand the concepts of chemistry and apply to various materials for engineering applications.

**UNIT – I WATER QUALITY AND TREATMENT**

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water:

For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.

Demineralisation of brackish water: Reverse Osmosis and Electrodialysis

**UNIT – II POLYMERS**

i) Introduction: Basic concepts of polymerisation, Types of polymerisation (Chain Growth (Addition), Step growth (Condensation)), Mechanism: cationic, anionic, free radical and coordination covalent.

Plastomers: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Teflon, Bakelite and nylons.

Elastomers

Natural Rubber; Processing of natural rubbers, Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, Buna-N, Polyurethane, Polysulfide (Thiokol) rubbers

ii) Conducting polymers: Mechanism, synthesis and applications of polyacetylene, polyaniline.

iii) Inorganic Polymers: Basic Introduction, Silicones, Polyphosphazins (-(R)<sub>2</sub>-P=N-) applications

### **UNIT – III ELECTROCHEMISTRY**

i) Galvanic cells, Nernst Equation, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen, Solid oxide)

ii) Corrosion: Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion. Galvanic series, factors affecting the corrosion (Metal and environment). Prevention: Cathodic protection (Sacrificial anode and impressed current), Inhibitors (Anodic and cathodic), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel)

### **UNIT – IV FUELS AND COMBUSTION**

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels: Coal-Classification and Analysis (proximate and ultimate), Coke :Characteristics of metallurgical coke, Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline- Octane Number, Diesel -Cetane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Natural gas, Producer gas, Water gas, Coal gas and Biogas. Determination calorific value of Gases fuels by Junker's calorimeter.

Combustion: Basic principles and numerical problems, Flue Gas analysis by Orsat's apparatus.

### **UNIT – V CHEMISTRY OF ENGINEERING MATERIALS**

i) Cement: Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening (Hydration and Hydrolysis)

ii) Refractories: Introduction, Classification , properties and applications

iii) Lubricants: Introduction, classification (Solid, liquid, semi solid, emulsion and synthetic), Theory of lubrication (Thin film, Thick film & Extreme pressure) , properties of lubricants and applications.

iv) Carbon clusters: Fullerenes and Carbon Nano Tubes (CNT)

#### **Text Books:**

1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GV and Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.
2. A Text Book of Engineering Chemistry, 15<sup>th</sup> Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

**References:**

1. A Text book of Engineering Chemistry, 12<sup>th</sup> Edition, SS Dhara,Uma, S. Chand Publications, New Delhi, 2010.
2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010.
3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

**Outcomes:** The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.



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**(15A01101) ENVIRONMENTAL STUDIES**

**OBJECTIVE:** *To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.*

**UNIT – I**

**MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: –**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION** : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### **UNIT – III**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**SOLID WASTE MANAGEMENT** : Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

### **UNIT – IV**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife

Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

## **UNIT – V**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

### **TEXT BOOKS :**

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.

### **REFERENCES :**

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

### **Outcomes :**

- (1) Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- (2) Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
- (3) Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

(4) By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.

At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

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**(15A01202) APPLIED MECHANICS LAB**

**OBJECTIVE:** This lab is aimed at making the student understand the concepts of Engineering Mechanics through demonstrable experiments

**LIST OF EXERCISES ( Any EIGHT of the Following):**

**(1) Polygon Law of Coplanar Forces**

To verify the Polygon Law of Coplanar Forces for a concurrent force system

**(2) Support Reactions of a Beam**

To find experimentally the reactions at the supports of a simply supported beam and verify the same with analytical values

**(3) Bell Crank Lever**

To verify the Principle of moments using the Bell Crank lever apparatus

**(4) Friction Plane**

To determine the coefficient of Static Friction between two surfaces

**(5) Moment of Inertia of Flywheel**

To find screw jack and determine the coefficient of friction between the threads of the screw

**(6) Compound Pendulum**

To estimate the acceleration due to gravity using a compound pendulum

**(7) Single Gear Crab**

To understand the gear arrangement and establish the law of machine

**(8) Double Gear Crab**

To compare the efficiency of Single and Double Gear Crab

**(9) Differential Pulley Block**

To establish law of machine

**(10) Differential Axle and Wheel**

To understand the velocity ratio of the machine and to interpret the law of machine

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**(15A51102) ENGINEERING CHEMISTRY LAB  
(Common to All Branches)**

**Objectives:**

- Will learn practical understanding of the redox reaction
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
- Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

**List of Experiments:**

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Alkalinity of Water
6. Determination of acidity of Water
7. Preparation of Phenol-Formaldehyde (Bakelite)
8. Determination of Viscosity of oils using Redwood Viscometer I
9. Determination of Viscosity of oils using Redwood Viscometer II
10. Determination of calorific value of gaseous fuels by Junker's Calorimeter
11. Conductometric estimation of strong acid using standard sodium hydroxide solution
12. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
13. Potentio metric determination of iron using standard potassium dichromate
14. Colorometric estimation of manganese.
15. pH meter calibration and measurement of pH of water and various other samples.

(Any 10 experiments from the above list)

**References:**

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical- Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

**Outcomes:**

- Would be confident in handling energy storage systems and would be able combat chemical corrosion
- Would have acquired the practical skill to handle the analytical methods with confidence.
- Would feel comfortable to think of design materials with the requisite properties
- Would be in a position to technically address the water related problems.

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**(15A99201) ENGINEERING & I.T. WORKSHOP**

**ENGINEERING WORKSHOP**

**Course Objective:**

*The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.*

**1. TRADES FOR EXERCISES:**

- a. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
- b. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
- c. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
- d. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
- e. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
- f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

**2. TRADES FOR DEMONSTRATION:**

- a. Plumbing
- b. Machine Shop
- c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.



**References:**

1. *Engineering Work shop practice for JNTU*, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. *Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.*
3. *Engineering Practices Lab Manual, Jeyapooan, SaravanaPandian, 4/e Vikas*
4. *Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.*

**I.T. WORKSHOP****Course Objective:**

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

**Learning Outcome:**

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing
- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer

**Preparing your Computer ( 5 weeks)**

**Task 1: Learn about Computer:** Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

**Task 2: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 3: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Task 4: Operating system features:** Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

## **Networking and Internet (4 weeks)**

**Task 5: Networking:** Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimping activity, logical configuration etc should be done by the student. The entire process has to be documented.

**Task 6: Browsing Internet:** Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

**Task 7: Antivirus:** Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

## **Productivity tools (6 weeks)**

**Task 8: Word Processor:** Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

**Task 9: Spreadsheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 10: Presentations :** creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

**Optional Tasks:**

**Task 11: Laboratory Equipment:** Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

**Task 12: Software:** Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

**References:**

1. Introduction to Computers, Peter Norton, Mc Graw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams”, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs”, Bigelows, TMH



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**Course Structure for Civil Engineering**  
**B. Tech Course**  
**(2015-16)**

**II B. Tech – I Sem**

S.No.	Course Code	Subject	L	Tu	Lab	C
1	15A54301	Mathematics - III	3	1	-	3
2	15A01301	Electrical and Mechanical Technology	3	1	-	3
3	15A01302	Building Materials and Construction	3	1	-	3
4	15A01303	Strength of Materials – I	3	1	-	3
5	15A01304	Surveying – I	3	1	-	3
6	15A01305	Fluid Mechanics	3	1	-	3
7	15A01306	Surveying Laboratory – I	-	-	4	2
8	15A01307	Strength of Materials Laboratory	-	-	4	2
		<b>Total</b>	<b>18</b>	<b>06</b>	<b>08</b>	<b>22</b>

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(15A54301) MATHEMATICS-III

(Common to All Branches)

## Objectives:

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

### UNIT – I

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonalization of matrix. Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

### UNIT – II

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.

### UNIT – III

**Interpolation:** Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

### UNIT – IV

Curve fitting: Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

### UNIT – V

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

**TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

**REFERENCES:**

1. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:**The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods.

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## (15A01301) ELECTRICAL & MECHANICAL TECHNOLOGY

### PART – A

#### **ELECTRICAL TECHNOLOGY**

##### **Objective:**

Electrical Technology contains basic Circuits, DC generators & motors, Transformers, Induction motors. The objective is to study their performance aspects.

##### **UNIT – I Introduction to DC & AC Circuits**

Ohm's Law, R, L, C Components, Kirchoff's Laws, Types of Sources, Simple problems on Resistive Networks, Series Parallel Circuits, Star Delta and Delta Star Transformation. Sinusoidal waveforms and Basic Definitions, Root Mean Square and average values of sinusoidal Currents and Voltages. Form Factor and Peak Factor.

##### **UNIT-II DC Machines**

**D.C Generators:** Constructional details of D.C. machines, Principle of Operation of D.C. generators, Types of D.C Generators, E.M.F Equation, O.C.C. of a D.C. Shunt Generator

**D.C Motors:** Principle of Operation of DC Motors, Torque Equation, Losses and Efficiency Calculation, Speed Control of D.C. shunt motor (Armature voltage control and Field flux control).

##### **UNIT-III AC Machines**

**1-phase Transformers:** Principle of Operation, Constructional Details, E.M.F. equation, Losses and Efficiency, OC & SC Tests.

**3-Phase Induction Motors:** Principle of Operation, Slip, Torque (Simple Problems), Slip-Torque characteristics.

**3-phase Alternators:** Principle of Operation-Constructional Details-EMF Equation.

##### **OUTCOME:**

After going through this course the student acquires knowledge on basics of Electrical Circuits, DC Machines, Transformers, Induction motors & Alternators.

##### **TEXT BOOKS:**

1. Basic Electrical Engineering, V. N. Mittle and Arvind Mittle, Mc Graw Hill (India) Pvt. Ltd., 2<sup>nd</sup> Edition, 2005.
2. Basic Electrical Engineering, T.K.Nagsarkar and M.S. Sukhija, Oxford University Press, 2<sup>nd</sup> Edition, 2011.

##### **REFERENCES:**

1. Basic Electrical Engineering, M.S.Naidu and S. Kamakshiah, Tata Mc Graw Hill, 3<sup>rd</sup> Edition, 2009.
2. Electrical and Electronic Technology, Hughes, Pearson Education.

## **PART – B**

### **MECHANICAL TECHNOLOGY**

#### **Objective:**

Mechanical Technology contains basic welding process, steam engines & turbines and their performance aspects will be studied.

#### **UNIT – I**

**WELDING PROCESSES:** Introduction to welding classification of welding processes, Oxyacetylene welding – equipment, welding fluxes and filler rods, Gas cutting, Introduction to arc welding – Manual metal arc welding. Submerged arc welding, TIG and MIG processes, soldering and brazing Importance, comparison and applications.

#### **UNIT - II**

Description and working of steam engines and steam turbines (Prime movers) – impulse and Reaction turbines. Description and working of I.C. Engines – 4 stroke and 2 stroke engines – comparison – Gas Turbines – Closed and open type gas turbines.

Reciprocating Air compressors – description and working of single stage and multistage reciprocating air compressors – inter cooling. Transmission of power; Belt, Rope, Chain and gear drive-simple problems.

#### **UNIT - III**

Block diagram of a vapour compression refrigeration system. Names of common refrigerates. Basic principles of air-conditioning. Room and General air conditioning systems Ducting – Different types of ventilation system. Earth moving machinery and Mechanical handling equipment – bull dozers – power shovels – Excavators – concrete mixer – Belt and bucket conveyers.

#### **TEXT BOOKS :**

1. Elements of Mechanical Engineering by S.N.Lal, Cengage Learning, 2013
2. Elements of Mechanical Engineering by S.Trymbaka Murthy, Universities Press, 2015
3. Manufacturing Technology, P.N. Rao, TMH

#### **REFERENCE BOOKS**

1. Pneumatics by Jagadeesha University Press,2015

#### **OUTCOME:**

After going through this course the student gets a thorough knowledge on basics of welding process, turbines, steam engines with which he/she can able to apply the above conceptual things to real-world problems and applications.



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**(15A01302) BUILDING MATERIALS & CONSTRUCTION**

**OBJECTIVES:** *To give the students a basic idea about the traditional and modern construction materials a brief knowledge on building components and its construction methodologies.*

**UNIT – I**

**INTRODUCTION TO BUILDING MATERIALS**

Traditional & Organic Building Materials – Stone – Dressing of Stones – Modern Building Materials – Bricks – Manufacturing process – Ceramic Products – Manufacturing Process – Building Materials for Low Cost Housing – Utilisation of Wastes for Alternative Building Materials – Sustainable Materials in Construction – National Standards.

**UNIT – II**

**GLASS:**

Introduction – Functions of Glass in Buildings – Constituents and Classification of Glass – Manufacturing Process – Properties of Glass – Common Types of Glass – Special Glass – Advantages and Disadvantages of Glass – National Standards.

**PLASTIC:**

Introduction – Polymerisation – Classification of Plastics – Commonly Used Plastics – Moulding and Fabricating for Plastic Products – Applications – Advantages – Disadvantages – Intelligent Use of Plastics in Buildings – National Standards.

**UNIT – III**

**INSULATING MATERIALS**

Thermal Insulating Materials: Introduction – Thermal Insulation – Heat Transfer Fundamentals – Thermal Properties of Insulating Materials – Selection of Insulating Materials – Classification of Insulation materials – Reflective Insulation Systems – Commonly Used Building Insulation Materials – National Standards.

Sound Insulating Materials: Introduction – Basics of Acoustics – Sound Absorption or Insulation – Green Insulation – National Standards.

**UNIT – IV**

**STRUCTURAL COMPONENTS:–**

Foundations – classification of Foundations – consideration in selection of foundation types – Masonry – Brick and block walls – Cavity walls – Damp-proof courses and membranes – Mortars – Arches and openings – Windows – Glass and glazing – Doors – Stairs – Types and Applications – Cladding to external walls – Flat roofs – Dormer windows – Formwork & Scaffolding – Precast concrete frames – Portal frames – Types – components – Framed structures – Components – Construction Procedure – Panel walls – National Standards.

**UNIT – V**

**INTERNAL CONSTRUCTION AND FINISHES**

Internal elements – Internal walls – Construction joints – Internal walls, fire protection – separating walls – Partitions – Plasters and plastering – Domestic floors and finishes – Sound insulation – Timber, concrete and metal stairs – Internal doors – Door sets – Fire resisting doors – Plasterboard ceilings – Suspended ceilings – Paints and painting – Components of Paints – Types of Paint – Considerations in Selecting Paints – Cement Paints – Oil Paints –

Emulsion Paints – Whitewash and Colourwash – Application of Paints –Distempers – Varnishes – Safety –Joinery production – Composite boarding – National Standards.

**TEXT BOOKS:**

1. Building Material by S K Duggal – New Age International Publishers; Second Edition
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
3. Building Materials by M.L.Gambhir, TMH Pubilishers.
4. A Textbook on Building Construction by S.K.Sharma, S.Chand Pubilishers.

**REFERENCES:**

1. Building construction by W.B.Mckay, Vol.I, II, III & IV Pearson Publications, 2013 edition.
2. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.
3. Building materials by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi
4. Building materials by S.C.Rangawala, Charotar Pubilishing House, Anand- INDIA.
5. Building Construction by S.C.Rangawala, Charotar Pubilishing House, Anand-INDIA

**Outcomes :**

On the completion of course, the students :

1. Will be able to understand the quality of various construction materials.
2. Will be able to prepare plan of staircase block.
3. Will be able to supervise the various construction activities at the time of actual execution.
4. Will be able to identify and select the materials for construction activities.

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**(15A01303) STRENGTH OF MATERIALS - I**

**OBJECTIVE:** *The subject provide the knowledge of simple stresses and strains, flexural stresses in members, shear stresses and deflection in beams so that the concepts can be applied to the Engineering problems.*

**UNIT – I**

**SIMPLE STRESSES AND STRAINS :** – Deformable bodies - Elasticity and Plasticity – Types of stresses and strains – Hooke’s law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson’s ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

Strain energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

**UNIT – II**

**SHEAR FORCE AND BENDING MOMENT:** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

**UNIT – III**

**FLEXURAL STRESSES :** Theory of simple bending – Assumptions – Derivation of bending equation:  $M/I = f/y = E/R$  – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

**SHEAR STRESSES:** Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections.

**UNIT – IV**

**DEFLECTION OF BEAMS:** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay’s methods.

Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L. uniformly varying load-Mohr’s theorems – Moment area method – application to simple cases including overhanging beams-deflections of propped cantilevers for simple loading cases.

**UNIT – V**

**CONJUGATE BEAM METHOD:** Introduction – Concept of conjugate beam method. Difference between a real beam and a conjugate beam. Deflections of determinate beams with constant and different moments of inertia.

**DIRECT AND BENDING STRESSES :** Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and bending moment about both axis.

**TEXT BOOKS :**

1. Mechanics of Materials – Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
2. Strength of Materials by R.K Rajput, S.Chand & Company Ltd.
3. Strength of Materials by B.S.Basavarajaiah, Universities Press, Hyderabad.

**REFERENCES:**

1. Strength of Materials by Ghosh & Datta, New Age Pubilishers
2. Strength of Materials by Dr.R.K.Bansal, Lakshmi Publications.
3. Strength of Materials by S.S.Rattan, TMH Publishers.

**Outcome :**

- (1) The students would be able to understand the behavior of materials under different stress and strain conditions.
- (2) The students would be able to draw bending moment, shear force diagram, bending stress and shear stress distribution for beams under the different conditions of loading.
- (3) The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams, and columns under various loading conditions using different analysis methods.

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**(15A01304) SURVEYING – I**

**OBJECTIVE:** *To ensure that the student develops knowledge of the basic and conventional surveying instruments, principles behind them, working of the instruments, plotting of the area from the field measurements, determination of the area and the theory behind curves.*

**UNIT – I**

**BASIC CONCEPTS:** Surveying – History; Definition; primary divisions, Classification, Principles of surveying Plan and map; Basic Measurements; Instruments and Basic methods; Units of measurement, Scales used for Maps and plans, Duties of a surveyor. Errors: Accuracy and Precision Sources and types of errors, theory of Probability, Rounding of numbers.

**CHAIN SURVEYING:** Instruments for chaining, Ranging out, chaining a line on a flat ground; Chaining on an uneven or a sloping ground; Chain & Tape corrections; Degree of accuracy. Principles of chain surveying; Basic definitions; Well-Conditioned Triangle, Field book, Field work; Offsets, Cross Staff survey; obstacles in chain survey-problems, Conventional signs.

**UNIT-II**

**COMPASS SURVEY:** Introduction, Bearings and angles, Designation of bearings, Conversion of bearings from one system to the other, fore bearing and back bearing, Calculation of bearing from angles, Theory of Magnetic compass (i.e. Prismatic compass), Temporary adjustments of compass-Magnetic Declination, Local attraction-Related Problems-Errors in compass survey.

**PLANE TABLE SURVEYING:** Introduction, Accessories, Working operations, Methods of plane tabling, Three point problem-Mechanical method -Graphical method, Two point problem, Errors in plane tabling.

**UNIT-III**

**LEVELLING:** Introduction, basic definitions, methods of leveling, leveling instruments: dumpy level, levelling staff, Temporary adjustments of dumpy level, theory of simple and differential leveling, Level field book, Classification of direct leveling methods, Reciprocal leveling, Profile leveling and Cross sectioning, Curvature and Refraction, Difficulties in leveling, errors in leveling, Degree of Precision.

**CONTOURING:** Introduction, contour interval, Characteristics of contours Methods of locating contours - Direct and indirect methods; Interpolation and sketching of contours, Contour gradient-Uses of contour maps.

**UNIT-IV**

**THEODOLITE:** Vernier Theodolite: Basic definitions; Fundamental lines and desired relations; Temporary adjustments; Measurement of a horizontal angle; Repetition and Reiteration methods of horizontal angle measurement. Measurement of vertical angle; Sources of errors in Theodolite survey.

**TRAVERSE SURVEYING:** Introduction, Selection and marking of traverse stations, methods of traversing, traversing by free needle and fast needle method, traversing by direct

observation of angles, checks in closed traverse, closing error, methods of balancing the traverse, Gale's traverse table, Omitted measurements.

#### **UNIT-V**

**COMPUTATION OF AREAS AND VOLUMES:** methods of determining areas, areas by sub-division into triangles, areas from offsets to a base line: regular and irregular intervals, area by double meridian distances, area by co-ordinates. embankments and cutting for a level section, two level sections, three level section and multi level section, volume of earth work from contour plan, capacity of a reservoir , volume of barrow pits.

**MINOR INSTRUMENTS:** Uses and working of the minor instruments: hand level, line ranger, optical square, Abney level, clinometers, pantagraph, sextant and planimeter.

#### **TEXT BOOKS:**

1. Surveying (Vol – 1,2 &3), by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) Ltd., New Delhi
2. Text book of surveying by C.Venkataramaiah, Universities Press.
3. Surveying (Vol – 1 & 2) by Duggal S.K, Tata McGraw Hill Publishing Co.Ltd. New Delhi, 2004.

#### **REFERENCES:**

1. Plane Surveying by Chandra AM, New age International PVt.Ltd., Publishers, New Delhi, 2002
2. Arora K R “Surveying (Vol-1 & 2), Standard Book House, Delhi, 2004
3. Advanced Surveying by Satheesh Gopi, R.Shanta Kumar and N.Madhu, Pearson education

#### **OUTCOMES:**

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

- (1) carry out preliminary surveying in the field of civil engineering applications such as structural, highway engineering and geotechnical engineering
- (2) plan a survey, taking accurate measurements, field booking, plotting and adjustment of traverse
- (3) use various conventional instruments involved in surveying with respect to utility and precision
- (4) plan a survey for applications such as road alignment and height of the building
- (5) undertake measurement and plotting in civil engineering

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**(15A01305) FLUID MECHANICS**

***OBJECTIVE:** This subject introduces the basic concepts of fluids, their behavioural properties, analyzing the fluid flows using primary equations. This subject further deals with various flow measuring devices and concepts of boundary layer flows.*

**UNIT – I**

**INTRODUCTION:** Dimensions and units – physical properties of fluids, specific gravity, viscosity, surface tension and capillarity, vapor pressure and their influences on fluid motion. Newtonian and non-Newtonian fluids. Fluid Pressure at a Point; Pascal’s law, Hydrostatic law, Atmospheric, Absolute and gauge pressure; Hydrostatic paradox, Pressure measurement manometers; Simple, differential and Micro Manometers

**HYDROSTATIC FORCES ON SURFACES:** Total Pressure and Centre of Pressure on Horizontal Plane Surface; Vertical Plane Surface; Inclined Plane Surface and Curved Surfaces.

**UNIT-II**

**BUOYANCY:** Buoyancy; Buoyant Force and Centre of Buoyancy, Stability of submerged bodies and floating bodies; Metacentre and metacentric height, analytical method for metacentric height.

**KINEMATICS OF FLUID MOTION:** Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Streamline; Pathline; Streakline; Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation; Velocity potential and stream function; Flow net; Vortex flow – free vortex and forced vortex flow.

**UNIT-III**

**DYNAMICS OF FLUID FLOW:** Forces acting on a Fluid in Motion; Euler’s equation of motion; Bernoulli’s equation ; Energy correction factor; Momentum principle; Force exerted on a pipe bend.

**FLOW MEASUREMENTS IN PIPES:** Discharge through Venturi Meter; Discharge through Orifice Meter; Discharge through flow nozzle; Measurement of velocity by Pitot tube, pitot-static tube.

**UNIT-IV**

**FLOWTHROUGH ORIFICES AND MOUTHPIECES:** Flow through Orifices: Classification of Orifices; Determination of coefficients for an Orifice Flow through large rectangular Orifice; Flow through submerged Orifice – fully sub-merged and Partially sub-merged. Classification of Mouthpieces; Flow through external and internal cylindrical Mouthpiece

**FLOW OVER NOTCHES & WEIRS:** Classification of Notches and Weirs; Flow through rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Cipolletti weir, Broad crested weir.

## **UNIT-V**

**ANALYSIS OF PIPE FLOW:** Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length; Hydraulic power transmission through a pipe; Siphon; Pipes in series, parallel & branched pipes.

**LAMINAR & TURBULENT FLOW IN PIPES:** Reynolds's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe (Hazen Poiseuille equation). Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, Friction factor for pipe flow.

### **TEXT BOOKS:**

- (1) Fluid Mechanics by Modi and Seth, Standard book house.
- (2) A Text of Fluid Mechanics and Hydraulic Machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.
- (3) Fluid Mechanics and Machinery by D.Rama Durgaiiah, New Age International.

### **REFERENCES:**

- (1) Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, Universities Press.
- (2) Fluid Mechanics and Machinery, CSP Ojha, Oxford Higher Education
- (3) Fluid mechanics and machinery by Garde, New Age Pubilishers.
- (4) Introduction to Fluid Machines by S.K.Som & G.Biswas .Tata Mc.Grawhill publishers PVt.Ltd.

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

- (1) determine the properties of fluid like pressure and their measurement
- (2) compute forces on immersed plane and curved plates
- (3) apply continuity equation and energy equation in solving problems on flow through conduits
- (4) compute the frictional loss in laminar and turbulent flows



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**(15A01306) SURVEYING LABORATORY -I**

**OBJECTIVE:** *To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.*

**LIST OF EXERCISES:**

- (1) Survey of an area by chain survey (Closed traverse) & Plotting
- (2) Chaining across obstacles
- (3) Determination of distance between two inaccessible points with compass.
- (4) Surveying of a given area by prismatic compass (Closed traverse) and plotting after adjustment.
- (5) Radiation method, intersection methods by plane Table survey
- (6) Two point and three point problems in plane table survey.
- (7) Traversing by plane table survey
- (8) Fly leveling (differential leveling)
- (9) An exercise of L.S. and C.S. and plotting.
- (10) Two exercises on contouring.

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**(15A01307) STRENGTH OF MATERIALS LABORATORY**

**OBJECTIVE:** *The object of the course to make the student to understand the behavior of materials under different types of loading for different types structures.*

**LIST OF EXERCISES:**

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
5. Hardness test.
6. Spring test.
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**Course Structure for Civil Engineering**  
**B. Tech Course (2015-16)**

**II B. Tech – II Sem**

S.No.	Course Code	Subject	L	Tu	Lab	C
1	15A54401	Probability and Statistics	3	1	-	3
2	15A52301	Managerial Economics & Financial Analysis	3	1	-	3
3	15A01401	Strength of Materials – II	3	1	-	3
4	15A01402	Surveying – II	3	1	-	3
5	15A01403	Structural Analysis – I	3	1	-	3
6	15A01404	Hydraulics & Hydraulic Machinery	3	1	-	3
7	15A01405	Fluid Mechanics & Hydraulic Machinery Laboratory	-	-	4	2
8	15A01406	Surveying Laboratory – II	-	-	4	2
9	15A01407	Comprehensive Online Examination-I	-	-	-	1
		<b>Total</b>	<b>18</b>	<b>06</b>	<b>08</b>	<b>23</b>

**Note:-** Survey camp for a duration of two weeks to be conducted before the commencement of III B.Tech, I – Sem class work, in the II B.Tech, II – Sem break. This survey camp has to be evaluated for 50 marks by the internal faculty. It has a weightage of 2 credits. The marks and credits will be incorporated in IV – B.Tech, II – Sem marks memo.

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## **(15A54401) PROBABILITY AND STATISTICS**

**(Common to CSE, IT, Civil, Mech.)**

**Objectives:** To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, Statistical Quality Control and Queuing theory

### **UNIT – I**

Basic concepts of Probability – Random variables – Expectation – Discrete and continuous Distributions – Distribution functions. Binomial and poisson distributions Normal distribution – Related properties.

### **UNIT – II**

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance. Test of significance - Test based on normal distribution - Z test for means and proportions.

### **UNIT – III**

Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

### **UNIT – IV**

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of  $\bar{X}$  - Chart, R-Chart, p - Chart and C-Chart.

### **UNIT – V**

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

### **TEXT BOOKS:**

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.

### **REFERENCES:**

1. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Statistical methods by S.P. Gupta, S.Chand publications.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B.

**Outcomes:** The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, Statistical Quality Control and Queuing theory and draw appropriate inferences.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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**(15A52301) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Course Objectives:** The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

## **Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Relationship of Managerial Economics with Financial Accounting and Management. **Demand Analysis:** Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting.

## **UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS**

**Production Function-** Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis:** Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)- Managerial significance and limitations of Break- Even Point.

## **UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT**

**Market structures:** Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

## **UNIT IV: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

## **UNIT V: CAPITAL AND CAPITAL BUDGETING**

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Short term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**Learning Outcome:** After completion of this course, the student will be able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

### **TEXT BOOKS:**

1. Managerial Economics 3/e, Ahuja H.L, S.Chand, 2013.
2. Financial Management, I.M.Pandey, Vikas Publications, 2013.

### **REFERENCES**

1. Managerial Economics and Financial Analysis, 1/e, Aryasri, TMH, 2013.
2. Managerial Economics and Financial Analysis, S.A. Siddiqui and A.S. Siddiqui, New Age International, 2013.
3. Accounting and Financial Management, T.S.Reddy & Y. Hariprasad Reddy, Margham Publishers.

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B. Tech II - II sem (C.E)

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## (15A01401) STRENGTH OF MATERIALS – II

*OBJECTIVE: Study of the subject provides the understanding of principal stress, strains, springs, columns and structures.*

### UNIT – I

**PRINCIPAL STRESSES AND STRAINS:** Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

**THEORIES OF FAILURES:** Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

### UNIT – II

**THIN CYLINDERS & THICK CYLINDERS :** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – Changes in dia, and volume of thin cylinders – Thin spherical shells.

Introduction Lamé's theory for thick cylinders – Derivation of lamé's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

### UNIT – III

**TORSION OF CIRCULAR SHAFTS** – Theory of pure torsion – Derivation of Torsion equations: – Assumptions made in the theory Theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

### SPRINGS:

Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple –springs in series and parallel – Carriage or leaf springs.

### UNIT – IV

**COLUMNS AND STRUTS :** Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns – assumptions – derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

### UNIT – V

**UNSYMMETRICAL BENDING :** Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of

rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid - Location of neutral axis – Deflection of beams under unsymmetrical bending.

**BEAMS CURVED IN PLAN :** Introduction – circular beams loaded uniformly and supported on symmetrically placed Columns – Semicircular beam simply-supported on three equally spaced supports.

**TEXT BOOKS:**

- (1) A Text book of Strength of materials by R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.
- (2) Strength of Materials by R.Subramanian, Oxford University Press.

**REFERENCES :**

- (1) Strength of Materials by S.S.Rattan, TMH Publishers.
- (2) Strength of Materials by D.S. Prakasa rao, University press, Hyderabad.
- (3) Strength of Materials by B.C.Punmia.- Laxmi publications
- (4) Mechanics of Structures, by Ghosh& Datta, New Age Publishers

**OUTCOMES:**

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

- (1) apply the principle of virtual work*
- (2) determine deflection of a beam for various loading conditions*
- (3) apply unit load method to find the deflection of truss*
- (4) determine different stresses developed in thick cylinders*
- (5) visualize the behavior of column for combined bending and axial loading*



# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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## **(15A01402) SURVEYING – II**

**OBJECTIVE:** *To ensure that the student develops knowledge in the working of advanced instruments, setting out of curves from the field measurements and basic knowledge on remote sensing*

### **UNIT-I**

**TRIGONOMETRIC LEVELLING :** Introduction; Determination of the level of the top of an object, When its base is accessible and When its base is not accessible; Determination of the height of the object when the two instrument stations are not in the same vertical plane; Axis signal correction; Difference in elevation by single observation and reciprocal observations.

### **UNIT-II**

**TACHEOMETRIC SURVEYING:** Definition, Advantages of Tacheometric surveying- Basic systems of tacheometric measurement , Principle of stadia measurements, Determination of constants K and C, Inclined sight with staff vertical; Inclined sight with staff normal to the line of sight, Movable hair method, Tangential method, Subtense bar, Errors in Tacheometry.

### **UNIT-III**

**TRIANGULATION:** Principles of triangulation, Uses of triangulation survey; Classification of triangulation; operations of triangulation survey; Signals and towers, Satellite station; Base line & Extension of the base line.

**SETTING OUT WORKS:** Introduction, Control stations; Horizontal control; Reference grid; Vertical control; Positioning of a structure; offset pegs, Setting out a foundation: reference pillars, batter boards, Setting out with a theodolite; Graded stakes; setting out a sewer; Setting out a culvert.

### **UNIT-IV**

**CURVES:** Simple curves–Definitions and Notations, designation of a curve, Elements of simple curves, location of tangent points, selection of peg interval, Methods of setting simple curves(based on equipment) – Rankines method, Two theodolite method. Compound curves – Elements of compound curve, setting out compound curve. Reverse curves – Elements of reverse curve, relationship between various elements.

### **UNIT-V**

**ELECTRONIC DISTANCE MEASUREMENTS:** Introduction, Basic concepts- electromagnetic waves, basic definitions, phase of the wave ,units, types of waves; distance from measurement of transit time, Computing the distance from the phase differences, , EDM instruments, electronic theodolites, total station-models, fundamental measurements, recording, traversing, data retrieval.

**REMOTE SENSING:** Introduction, Principle of Remote sensing, EM Radiation and the atmosphere, interaction of EM radiation with earth's surface, remote sensing observation platforms, sensors, applications of remote sensing. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications.

**TEXT BOOKS:**

1. Text book of surveying by C.Venkataramaiah, Universities Press.
2. Surveying Vol. 1 & II by Dr. K. R. Arora; Standard Book House;
3. Higher Surveying by Chandra, New age Publishers.

**REFERENCE BOOKS:**

1. Surveying Vol. 1 and 2 – By S.K. Duggal. Tata Mc. Graw Hill Publishing Co.
2. Advanced Surveying by Satheesh Gopi, R.Shanta Kumar and N.Madhu, Pearson education
3. Surveying Vol-I&II by B.C. Punmia ,Laxmi Publications
4. Advanced Surveying by Mahajan, Santhos K. Dhanpat Rai & Sons, Nai Sarak, Delhi, 1987.

**OUTCOMES:**

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

- (1) carry out advanced surveying techniques in the field of civil engineering applications such as structural, highway engineering and geotechnical engineering*
- (2) setting out works and carrying out of various curves alignment,*
- (3) use of various advanced instruments involved in surveying with respect to utility and precision*
- (4) Knowledge on remote sensing elements and their applications.*

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II - II sem (C.E)

<b>T</b>	<b>Tu</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>3</b>

## (15A01403) STRUCTURAL ANALYSIS – I

**OBJECTIVE:** To make the students to understand the principles of analysis of structures of static and moving loads by various methods.

### UNIT – I

**ENERGY THEOREMS :** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano’s first theorem-Deflections of simple beams and pin jointed trusses.

### UNIT – II

**ANALYSIS OF INDETERMINATE STRUCTURES :** Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano’s theorem..

### UNIT – III

**FIXED BEAMS & CONTINUOUS BEAMS :** Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

### UNIT – IV

**SLOPE-DEFLECTION:** Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports- Analysis of single bay, single storey, portal frame including side sway .

### UNIT – V

**MOMENT DISTRIBUTION METHOD** Introduction to moment distribution method-application to continuous beams with and without settlement of supports. Analysis of single storey portal frames – including Sway

### 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 by Aslam Kassimali, Cengage Publishers.
- (3) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.

### REFERENCES :

- (1) Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.
- (2) Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
- (3) Structural Analysis – D.S.Prakasa rao - Univeristy press, Hyderabad.
- (4) Basic Structural Analysis by K.U.Muthu, I.K.International Publishers, India.
- (5) Structural Analysis by S S Bhavikatti – Vikas Publishing House.
- (6) Analysis of Structures – Vol-I&II by V.N.Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.

**OUTCOMES:**

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

- (1) The student would be able to apply knowledge of various energy theormes.*
- (2) The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams, and columns under various loading conditions using different analysis methods.*
- (3) The student would be able to apply knowledge on study of slope and deflection of various members with sinking supports also.*

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II - II sem (C.E)

T	Tu	C
3	1	3

## (15A01404) HYDRAULICS AND HYRAULIC MACHINERY

**OBJECTIVE:** *The main objective of this course is to deal with the concepts of flow through open channels and their applications and the principles of hydraulic machines and hydraulic models.*

### UNIT – 1

**OPEN CHANNEL FLOW-UNIFORM FLOW:** Introduction, Classification of flows, Types of channels; Flow analysis: The Chezy equation, Empirical formulae for the Chezy constant, Hydraulically efficient channel sections: Rectangular, Trapezoidal, Triangular and Circular channels; Velocity distribution; Energy and momentum correction factors. Application of Bernoulli's equation to open channel flow.

**OPEN CHANNEL FLOW- NON – UNIFORM FLOW:** Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; discharge curve, Different slope conditions; Channel transitions- Reduction in width of a rectangular channel, Raised bottom in a rectangular channel, venture flume, Momentum principle applied to open channel flow; Specific force; Specific force curve.

### UNIT – II

**OPEN CHANNEL FLOW- GRADUALLY VARIED FLOW:** Introduction, Dynamic equation; Dynamic equation for GVF in wide Rectangular channel, classification of channel bottom slopes, Surface Profiles; Characteristics of surface profiles, Back water Curves and Draw down curves; Examples of various types of water surface profiles; Control section, Computation of surface profiles by single step method.

**OPEN CHANNEL FLOW- RAPIDLY VARIED FLOW:** Hydraulic jump; Elements and characteristics of hydraulic jump; Hydraulic jump in rectangular channels, height and length of the jump, Energy loss in a hydraulic jump, Types of hydraulic jump; applications of hydraulic jump; Location of hydraulic jump,.

### UNIT – III

**IMPACT OF JETS:** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for

Work done and efficiency-Angular momentum principle, Torque and head transferred in roto dynamic machines.

**HYDRAULIC TURBINES-I:** Introduction, head and efficiencies of hydraulic turbines, Classification of turbines; pelton wheel: parts, Velocity triangles, work done and efficiency, working proportions, design of pelton wheel. Radial flow reaction turbines: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio.

### UNIT – IV

**HYDRAULIC TURBINES-II:** Francis turbine: main components and working, work done and efficiencies, design proportions; design of Francis turbine runner. Kaplan turbine: main

components and working, working proportions. Draft tube: theory and efficiency; specific speed, unit quantities, characteristic curves of hydraulic turbines. Cavitation: causes, effects. **CENTRIFUGAL PUMPS:** Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed; Priming ;specific speed; limitation of suction lift, net positive suction head(NPSH);Performance and characteristic curves; Cavitation effects ;Multistage centrifugal pumps; troubles and remedies.

#### **UNIT – V**

**DIMENSIONAL ANALYSIS AND SIMILITUDE:** Introduction, dimensions; Dimensional homogeneity; Methods of dimensional analysis- Rayleigh's method; Buckingham – Pi theorem; model analysis; similitude-types of similarities; Dimensionless numbers; Model laws ;Partially submerged objects; types of models; Scale effect.

**BOUNDARY LAYER THEORY& DRAG AND LIFT:** Boundary layer – concepts, Prandtl's contribution, Characteristics of boundary layer along a thin flat plate, laminar and turbulent Boundary layers, separation of BL. expression for drag and lift; Lift and Drag Coefficients; pressure drag and friction drag; Streamlined and bluff bodies.

#### **TEXT BOOKS :**

- (1) Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
- (2) A text of Fluid mechanics and hydraulic machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.
- (3) Introduction to Fluid Mechanics & Fluid Machines by S.K.Som & G.Biswas, Tata Mc.Grawhill publishers PVt.Ltd.

#### **REFERENCES :**

- (1) Fluid mechanics and Fluid Machines by Rajput, S.Chand & Co.
- (2) Fluid Mechanics & Fluid Machines by Narayana Pillai, Universities press.
- (3) Fluid Mechanics and Machinery -Kothandaraman, New Age Publishers.
- (4) Flow in Open channels by K.Subramanya. Tata McGraw-Hill Publishers.
- (5) Fluid Mechanics and Machinery, CSP Ojha, Oxford Higher Education

#### **OUTCOMES:**

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

1. *visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe, flow measurement through orifices, mouth pieces, notches and weirs*
2. *analyze fluid flows in open channel hydraulics and devices such as weirs and flumes*
3. *design open channels for most economical sections like rectangular, trapezoidal and circular sections*
4. *measure velocity through instruments in open channel and pipe flow*
5. *calculate forces and work done by a jet on fixed or moving plate and curved plates*
6. *apply the working principles of Impulse and Reaction turbines*
7. *select the type of turbine required with reference to available head of water and discharge*
8. *determine the characteristics of centrifugal pump*
9. *apply the working principles of the Reciprocating pump*

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II - II sem (C.E)

T	C
4	2

## (15A01405) FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY

**OBJECTIVE:** *The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.*

### SYLLABUS :

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

### Reference Books:-

1. Fluid Mechanics and Hydraulic Machines: A Lab Manual by [T.S. Desmukh](#), Laxmi Publications.
2. Experiments In Hydraulics & Hydraulic Machines By [Prakash](#), Phi Publications.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B. Tech II - II sem (C.E)**

<b>T</b>	<b>C</b>
<b>4</b>	<b>2</b>

## **(15A01406) SURVEYING LABORATORY – II**

**OBJECTIVE:** *To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.*

### **LIST OF EXERCISES:**

1. Study of theodolite in detail – practice for measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of repetition and reiteration.
3. Trigonometric Leveling – Heights and distance problem (Two Exercises).
4. Heights and distance using Principles of tachometric surveying (Two Exercises)
5. Curve setting – different methods. (Two Exercises)
6. Setting out works for buildings & pipe lines.
7. Determination of area using total station.
8. Traversing using total station.
9. Contouring using total station.
10. Determination of remote height using total station.
11. Distance, gradient, Diff. height between tow inaccessible points using total stations.



**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)**

<b>S. No.</b>	<b>Course Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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.

**Minor Degree in Civil Engineering**

S. No.	Course Code	Subject	L	T	P	C
<b>III B. Tech – I Semester</b>						
1	15A01302	Building Materials and Construction	3	1	-	3
<b>III B. Tech – II Semester</b>						
2	15A01502	Estimation, Costing and Valuation	3	1	-	3
<b>IV B. Tech –I Semester</b>						
3	15A01601	Concrete Technology	3	1	-	3
<b>IV B. Tech – II Semester</b>						
4	15A01703	Environmental Engineering	3	1	-	3
<b>Total</b>			<b>12</b>	<b>4</b>	<b>-</b>	<b>12</b>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<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>15A01501 DESIGN &amp; DRAWING OF RCC STRUCTURES</b>				

**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>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>15A01502</b>	<b>ESTIMATION, COSTING AND VALUATION</b>			

**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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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<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>15A01503</b>	<b>GEOTECHNICAL ENGINEERING – I</b>			

**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 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*

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

L	T	P	C
3	1	0	3

**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.Chennkesavulu, 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 Ramamuratam, 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>15A01506</b>	<b>COST EFFECTIVE HOUSING TECHNIQUES</b>			
	<b>(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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15A01507	<b>WATER HARVESTING AND CONSERVATION</b>			
	<b>(MOOCS – I)</b>			

**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*

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**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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**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, 0.15mm, 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 Bhrgudanda, 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 Sahni](#)
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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**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.

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**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.*

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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.

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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

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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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**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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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech IV-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>15A01702</b>	<b>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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**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 WATE 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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B. Tech IV-I Sem. (C.E)	L	T	P	C
	3	1	0	3
<b>15A01704 WATER RESOURCES ENGINEERING-II</b>				

**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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<b>B. Tech IV-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>15A01705</b>	<b>DESIGN AND DRAWING OF IRRIGATION STRUCTURES (CBCC-II)</b>			

**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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B. Tech IV-I Sem. (C.E)	L	T	P	C
	3	1	0	3
<b>15A01706 GROUND IMPROVEMENT TECHNIQUES (CBCC - II)</b>				

**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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B. Tech IV-I Sem. (C.E)	L	T	P	C
	3	1	0	3
<b>15A01707 AIR POLLUTION AND QUALITY CONTROL</b>				
<b>(CBCS - II)</b>				

**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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<b>B. Tech IV-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>15A01708</b>	<b>BRIDGE ENGINEERING</b>			
	<b>(CBCS - III)</b>			

**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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<b>B. Tech IV-I Sem. (C.E)</b>	<b>L T P C</b>
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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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<b>B. Tech IV-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>

**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*

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

L	T	P	C
0	0	4	2

**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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<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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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L	T	P	C
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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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech IV-II 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>15A01802</b>	<b>ADVANCED STRUCTURAL ENGINEERING</b>			
	<b>(MOCS – II)</b>			

**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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L	T	P	C
3	1	0	3

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

L	T	P	C
3	1	0	3

**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.*