**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY**
**(AUTONOMOUS)**
**Bachelor of Technology**
**Department of Civil Engineering**

**I B. Tech. – I Semester (CE)**

| S.No. | Course Code | Subject | L | T | P/Drg | C |
|-------|-------------|---------|---|---|-------|---|
| 1. | 16HS601 | Functional English | 3 | - | - | 3 |
| 2. | 16HS602 | Engineering Mathematics – I | 3 | 1 | - | 3 |
| 3. | 16HS603 | Engineering Physics | 3 | 1 | - | 3 |
| 4. | 16CS501 | Computer Programming | 3 | 1 | - | 3 |
| 5. | 16HS606 | Human Values & Professional Ethics | 3 | - | - | 3 |
| 6. | 16HS608 | Engineering Physics Lab | - | - | 4 | 2 |
| 7. | 16CS502 | Computer Programming Lab | - | - | 4 | 2 |
| 8. | 16ME301 | Engineering & IT Workshop Lab | - | - | 4 | 2 |
| | | Contact Periods / Week | **15** | **3** | **12** | **21** |
| | | | Total/Week 30 | | | |

**I B. Tech. – II Semester (CE)**

| S.No. | Course Code | Subject | L | T | P | C |
|-------|-------------|---------|---|---|---|---|
| 1. | 16HS610 | Professional English | 3 | - | - | 3 |
| 2. | 16HS611 | Engineering Mathematics – II | 3 | 1 | - | 3 |
| 3. | 16HS604 | Engineering Chemistry | 3 | 1 | - | 3 |
| 4. | 16ME302 | Engineering Graphics | - | - | 6 | 3 |
| 5. | 16CE101 | Engineering Mechanics | 3 | 1 | - | 3 |
| 6. | 16HS607 | English Language and Communication Skills Lab | - | - | 4 | 2 |
| 7. | 16HS609 | Engineering Chemistry Lab | - | - | 4 | 2 |
| 8. | 16CE102 | Applied Mechanics Lab | - | - | 4 | 2 |
| | | Contact Periods / Week | **12** | **3** | **18** | **21** |
| | | | Total/Week 33 | | | |

**II B. Tech. – I Semester (CE)**

| S.No. | Course Code | Subject | L | T | P | C |
|-------|-------------|---------|---|---|---|---|
| 1. | 16HS612 | Engineering Mathematics – III | 3 | 1 | - | 3 |
| 2. | 16EE209 | Electrical & Mechanical Technology | 3 | 1 | - | 3 |
| 3. | 16CE103 | Strength of Materials – I | 3 | 1 | - | 3 |
| 4. | 16CE105 | Surveying | 3 | 1 | - | 3 |
| 5. | 16CE106 | Fluid Mechanics | 3 | 1 | - | 3 |
| 6. | 16CE107 | Building Materials & Construction | 3 | 1 | - | 3 |
| 7. | 16CE108 | Surveying Lab – I | - | - | 4 | 2 |
| 8. | 16CE109 | Strength of Materials Lab | - | - | 4 | 2 |
| | | **Credit Course** | | | | |
| 9. | COE-I | Comprehensive Online Examination-I | - | - | - | 1 |
| | | **Audit Course** | | | | |
| 10. | 16CS503 | Data Structures through C | 3 | - | - | - |
| | | Contact Periods / Week | 21 | 6 | 8 | 23 |
| | | | Total/Week | 35 | | |

**II B. Tech. – II Semester (CE)**

| S.No. | Course Code | Subject | L | T | P | C |
|-------|-------------|---------|---|---|---|---|
| 1. | 16HS613 | Probability & Statistics | 3 | 1 | - | 3 |
| 2. | 16HS605 | Environmental Studies | 3 | 1 | - | 3 |
| 3. | 16CE110 | Building Planning & Drawing | 3 | 1 | - | 3 |
| 4. | 16CE111 | Strength of Materials – II | 3 | 1 | - | 3 |
| 5. | 16CE113 | Hydraulics & Hydraulic Machinery | 3 | 1 | - | 3 |
| 6. | 16CE114 | Surveying Lab – II | - | - | 4 | 2 |
| 7. | 16CE115 | Computer Aided Drawing Lab | - | - | 4 | 2 |
| 8. | 16CE116 | Fluid Mechanics & Hydraulic Machinery Lab | - | - | 4 | 2 |
| | | **Credit Course** | | | | |
| 9. | COE-II | Comprehensive Online Examination-II | - | - | - | 1 |
| | | **Audit Course** | | | | |
| 10. | 16HS614 | Comprehensive Soft Skills | 3 | - | - | - |
| | | Contact Periods / Week | 15 | 5 | 16 | 22 |
| | | | Total/Week | 36 | | |

**III B.Tech– I Semester (C.E)**

| S.No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | 16CE117 | Structural Analysis – I | 3 | 1 | - | 3 |
| 2. | 16CE118 | Concrete Technology | 3 | 1 | - | 3 |
| 3. | 16CE119 | Design & Drawing of Reinforced Concrete Structures | 3 | 1 | - | 3 |
| 4. | 16CE120 | Water Resources Engineering – I | 3 | 1 | - | 3 |
| 5. | 16CE121 | Engineering Geology | 3 | 1 | - | 3 |
| 6. | 16CE122 | Geotechnical Engineering – I | 3 | 1 | - | 3 |
| 7. | 16CE123 | Concrete Technology Lab | - | - | 4 | 2 |
| 8. | 16CE124 | Engineering Geology Lab | - | - | 4 | 2 |
| **Credit Course** | | | | | | |
| 9. | COE-III | Comprehensive Online Examination-III | - | - | - | 1 |
| **Audit Course** | | | | | | |
| 10. | 16HS616 | Aptitude Practice-I | 3 | - | - | - |
| | Contact Periods / Week | | 21 | 6 | 08 | **23** |
| | | | Total/Week 35 | | | |

**III B.Tech – II Semester (C.E)**

| S.No. | Course Code | Subject | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | 16CE125 | Structural Analysis – II | 3 | 1 | - | 3 |
| 2. | 16CE126 | Design & Drawing of Steel Structures | 3 | 1 | - | 3 |
| 3. | 16CE127 | Geotechnical Engineering – II | 3 | 1 | - | 3 |
| 4. | 16CE128 | Water Resources Engineering – II | 3 | 1 | - | 3 |
| 5. | 16CE129 | Transportation Engineering– I | 3 | 1 | - | 3 |
| 6. | 16CE130 | Geotechnical Engineering Lab | - | - | 4 | 2 |
| 7. | 16CE131 | Transportation Engineering Lab | - | - | 4 | 2 |
| 8. | 16HS615 | Advanced English Language and Communication Skills Lab | - | - | 4 | 2 |
| **Credit Course** | | | | | | |
| 9. | COE-IV | Comprehensive Online Examination-IV | - | - | - | 1 |
| **Audit Course** | | | | | | |
| 10. | 16HS617 | Aptitude Practice-II | 3 | - | - | - |
| | Contact Periods / Week | | 18 | 5 | 12 | **22** |
| | | | Total/Week 35 | | | |

**IV B.Tech – I Semester (C.E)**

| S.No | Course Code | Subject | L | T | P | C |
|------|-------------|---------|---|---|---|---|
| 1. | 16MB750 | Managerial Economics and Financial Analysis | 3 | - | - | 3 |
| 2. | 16CE132 | Transportation Engineering – II | 3 | 1 | - | 3 |
| 3. | 16CE133 | Environmental Engineering | 3 | 1 | - | 3 |
| 4. | 16CE134 | Estimation, Costing and Valuation | 3 | 1 | - | 3 |
| 5. | | **Department Elective – I** | 3 | 1 | - | 3 |
| | 16CE135 | Finite Element Methods in Civil Engineering | | | | |
| | 16CE136 | Remote Sensing & GIS | | | | |
| | 16CE137 | Air Pollution& Management | | | | |
| 6. | | **Open Elective** | 3 | - | - | 3 |
| | 16EE239 | Neural Networks & Fuzzy Logic | | | | |
| | 16ME313 | Non-Conventional Energy Resources | | | | |
| | 16EC443 | Mat lab Programming | | | | |
| | 16CS511 | Database Management Systems | | | | |
| | 16MB752 | Intellectual Property Rights | | | | |
| 7. | 16CE138 | Environmental Engineering Lab | - | - | 4 | 2 |
| 8. | 16CE139 | Computer Aided Design Lab | - | - | 4 | 2 |
| | | Contact Periods / Week | 18 | 4 | 8 | **22** |
| | | | Total/Week 30 | | | |

**IV B.Tech – II Semester (C.E)**

| S.No | Course Code | Subject | L | T | P | C |
|------|-------------|---------|---|---|---|---|
| 1. | 16CE140 | Design & Drawing of Irrigation Structures | 3 | 1 | - | 3 |
| 2. | | **Department Elective – II** | 3 | 1 | - | 3 |
| | 16CE141 | Advanced Foundation Engineering | | | | |
| | 16CE142 | Advanced Structural Design | | | | |
| | 16CE143 | Water Resources Systems Planning & Management | | | | |
| 3. | | **Department Elective – III** | 3 | 1 | - | 3 |
| | 16CE144 | Construction Technology and Project Management | | | | |
| | 16CE146 | Ground Improvement Techniques | | | | |
| | 16CE147 | Prestressed Concrete | | | | |
| 4. | | **Department Elective – IV** | - | - | - | 3 |
| | **MOOCS** | MOOC courses-offered by SWAYAM/ NPTEL/ NISTE-suggested by the department(online courses) | | | | |
| 5. | 16CE148 | Seminar | -- | -- | 04 | 2 |
| 6. | 16CE149 | Project | -- | -- | 20 | 10 |
| | | Contact Periods / Week | 09 | 02 | 24 | **24** |
| | | | Total/Week 35 | | | |

**Note: *L-Lecture hours, T-Tutorial, P-Practical, Drg: Drawing, C-Credit**

**Total credits: 178**

| Year | 1st year | | 2nd year | | 3rd year | | 4th year | | Total |
|------|----------|--------|----------|--------|----------|--------|----------|--------|-------|
| Semester | I sem | II sem | I sem | II sem | I sem | II sem | I sem | II sem | |
| Credits | 21 | 21 | 23 | 22 | 23 | 22 | 22 | 24 | 178 |

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY**
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**I B. Tech. – I Sem. (CE)**          **L**    **T**    **C**
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**(16HS601) FUNCTIONAL ENGLISH**
**(Common to All Branches)**

**Course Objectives:**
- To develop communication skills among the students.
- To construct proficiency in academic and social purpose to improve their grammatical accuracy.
- To understand LSRW skills and inculcate the habit of reading for pleasure.
- To obtain study skills and communication skills in formal and informal situations.
- To use appropriate vocabulary

**Course Outcomes:**
Students will be able to
- Use LSRW skills through the prescribed text and develop their ability to communicate effectively.
- Articulate well among themselves and with Faculty.
- Construct compound sentences using common conjunctions.
- Manage to organize and deliver oral presentations.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively.

**UNIT I**
**MINDSCAPES (Environmental Consciousness: Pollution - How To Regain Green Cover):**
1. Learning English Language through Literature (Secret of work- Swami Vivekananda)
2. Present, Past and Future aspects
3. Introducing oneself
       Grammar: Parts of speech-Kinds of sentences-Tenses
       Vocabulary: Synonyms & Antonyms-Affixes – Phrasal verbs
       Listening & Reading Activities
       Writing: Paragraph writing-Note taking & Note making
       Phonetics- Syllabification

**UNIT II**
**MINDSCAPES (Emerging Technologies: Solar Thermal Power- Nano Technology):**
1. Learning English Language through Literature (Stopping by Woods on a Snowy Evening-Robert Frost)
2. Set in the Past
3. Inter-personal skills Grammar – Articles – Past Events – Voice & Impersonal passive voice – Gerund & -ing forms
       to-infinitives
       Vocabulary: Phrases – Idioms – word roots
       Listening & Reading Activities
       Writing: Letter writing-Informal-Formal
       Phonetics – Accent

**UNIT III**
**MINDSCAPES (Global Issues: Child Labor- E- Waste):**
1. Learning English Language through Literature (What is my Name?- P.Satyavathi)
2. Describing a person, place and object
3. Possibilities

     Grammar: Modals – Conditionals – Framing Questions – Compound nouns
     Verbs
     Vocabulary:  One word substitute– Fixed expressions– Clauses
     Listening & Reading Activities
     Writing: Information transfer
     Intonation: Falling & Rising

**UNIT IV**
**MINDSCAPES (Space Trek: Hubble Telescope- Genesis of ISRO):**
1. Learning English Language through Literature (Man in Black-Oliver Goldsmith)
2. Analytical thinking
3. Co-operative learning
     Grammar:  Concord–Reported speech-compare & contrast
     Vocabulary: Numerical expressions-definitions-collocations
     Listening & Reading
     Writing: Summary-Essay writing-Making instructions
     JAM

**UNIT V**
**MINDSCAPES (Media Matters: History Of Media- Power of Media- Interviews):**
1.  Learning English Language through Literature (The Power of Prayer-Abdul Kalam)
2. Exploring creative ideas
3. Synthesis of sentences
     Grammar: Simple, compound and complex-Spotting errors
     Vocabulary: Discourse markers-Homonyms-Homophones-Homographs
     Listening & Reading Activities
     Writing: Writing recommendations-scrambled sentences
     Convincing others

**TEXT BOOKS:**
1. *Mindscapes:* English for Technologists and Engineers- Orient Black Swan, 2014.
2. *Paths to Progress in English: Orient Black Swan*
**REFERENCES:**
1. *Raymond Murphy's Intermediate English Grammar with CD*, Raymond Murphy, Cambridge University Press, 2012.
2. *Communication Skills*, Sanjay Kumar & Pushpalatha, Oxford University Press, 2012.
3. *Writing Tutor*. Advanced English Learners' Dictionary, 9th Edition, Oxford University Press, 2015.
4. *Powerful Vocabulary Builder*, Anjana Agarwal, New Age International Publishers, 2011.
5. *Keep Talking*, F. Klippel, Cambridge University Press, 2013.
6. *Listening Extra*, Miles Craven, Cambridge University Press, 2008.
7. *Reading Extra*, Liz Driscoll, Cambridge University Press, 2004.
8. *Writing Extra*, Graham Palmer, Cambridge University Press, 2004.
9. *Speak Well*, Jayashree Mohanraj et al, Orient Blackswan, 2013.

# SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY
## (AUTONOMOUS)

**I B. Tech. – I Sem. (CE)**

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| 3 | 1 | 3 |

## (16HS602) ENGINEERING MATHEMATICS-I
### (Common to all Branches)

**Course Objectives:**
- To train the students thoroughly in Mathematical concepts of ordinary differential equations, multiple integrals, Laplace Transforms and their applications
- To prepare students for lifelong learning and successful careers using mathematical concepts of ordinary differential equations, multiple integrals, Laplace Transforms and their applications
- To develop the skill pertinent to the practice of the mathematical concepts including the student abilities to formulate and modeling the problems, to think creatively and to synthesize information

**Course Outcomes:**
- The students become familiar with the application of ordinary differential equations, multiple integrals, Laplace Transforms and their applications
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems with engineering applications

## UNIT I
**DIFFERENTIAL EQUATIONS:** Exact and Non-exact (Integrating factors), Linear and Bernoulli differential equations, Applications to first order equations: Orthogonal Trajectories, Newton's Law of Cooling, Natural Law of Growth and Decay. Linear Differential Equations of second and higher order with constant coefficients. Method of variation of parameters. Applications of linear differential equations- Simple electric circuits.

## UNIT II
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 III
**MULTIPLE INTEGRALS:** Evaluation of Double and Triple integrals, Change of order of integration, Change of variables. Simple applications to areas.

## UNIT IV
**LAPLACE TRANSFORM I:** Laplace transforms of standard functions, First shifting Theorem, Transforms of derivatives and integrals, Unit step function, Second shifting theorem, Laplace transforms of Periodic functions.

## UNIT V
**LAPLACE TRANSFORM II: Inverse** Laplace Transforms, Convolution theorem, Application of Laplace transforms to ordinary differential equations of first and second order.

**TEXT BOOKS:**
1. *Higher Engineering Mathematics*, B.S.Grewal, Khanna publishers-42$^{nd}$ Edition (2012).
2   *Engineering Mathematics* Volume-I, by T.K.V. Iyengar, S.Chand publication-12$^{th}$Edition.

**REFERENCES:**
1. *Engineering Mathematics*, Volume - I, E. Rukmangadachari & E.Keshava Reddy,  Pearson Publisher 1st Edition (2010)
2. *Engineering Mathematics*, Volume - I, by G.S.S.Raju, CENGAGE publisher (2013).
3. *Advanced Engineering Mathematics*, by Erwin Kreyszig, Wiley India-10$^{th}$ Edition (2012).
4. *Higher Engineering Mathematic*s, by B.V.Ramana, Mc Graw Hill publishers (2008).
5. *Advanced Engineering Mathematics*, by Alan Jeffrey, Elsevier-1$^{st}$ Edition (2001).

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**I B. Tech. – I Sem. (CE)**                                    **L    T    C**
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**(16HS603) ENGINEERING PHYSICS**
**(Common to CE, EEE & ME)**

**Course Objectives:**
- To evoke interest on applications of superposition effects like interference & diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric wave guides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays & non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity, classical & quantum free electron model & evaluation of band theory to distinguish materials & to understand electron transport mechanism in solids.
- To open new avenues of knowledge & understanding semiconductor based electronic devices, basic concepts and applications of semiconductors & 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 & their fascinating applications. Considering the significance of microminiaturization of electronic devices & significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties & applications in emerging technologies are elicited.

**Course 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 with defects in crystals & ultrasonic non destructive techniques.
- The discrepancies between the classical estimates & 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 & magnetic materials are illustrated.
- The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.

**UNIT I**
**PHYSICAL OPTICS, LASERS AND FIBRE OPTICS:** Physical Optics: Interference - Introduction - Interference in thin films by reflection – Newton's Rings. Diffraction - Introduction- Fraunhofer diffraction due to single slit and diffraction grating.

**LASERS:** Introduction - Characteristics of laser – Spontaneous and stimulated emission of radiation –-Einstein's relation, Population inversion – Excitation mechanism & optical resonator – ND: YAG laser - He-Ne laser, semiconductor diode laser -Applications of lasers.

**FIBRE OPTICS:** Introduction– Construction and working principle of optical fiber – Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in fibers -Optical fiber communication system – Applications of optical fibers in communications, sensors and medicine.

**UNIT II**

**CRYSTALLOGRAPHY, ACOUSTICS AND ULTROSONICS:** Crystallography**:** Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice –Crystal systems – Packing fractions of SC, BCC and FCC-Directions and planes in crystals – Miller indices – Inter planar spacing in cubic crystals – X-ray diffraction - Bragg's law.

Acoustics Intensity – Absorption coefficient and its determination –Reverberation – Reverberation time (qualitative treatment) – Factors affecting acoustics of buildings and their remedies. Ultrasonics Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

**UNIT III**

**QUANTUM MECHANICS AND FREE ELECTRON THEORY:** Quantum Mechanics**:** Introduction to matter waves – de'Broglie hypothesis - Heisenberg's uncertainty principle and its applications - Schrödinger's time independent and time dependent wave equation – Significance of wave function - Particle in a one dimensional infinite potential well .

Free Electron theory: Classical free electron theory - Equation for electrical conductivity - Quantum free electron theory - Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

**UNIT IV**

**SEMICONDUCTORS AND MAGNETIC MATERIALS:** Semiconductor Physics: Introduction – Intrinsic and extrinsic semiconductors (qualitative treatment), Drift & diffusion currents - Einstein's relation– Hall effect Direct & indirect band gap semiconductors. 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 – Hysteresis - Soft and hard magnetic materials and applications.

**UNIT V**

**SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS:** Superconductivity: Introduction – Meissner effect - Properties of superconductors- Type I and Type II superconductors- ac and dc Josephson effects BCS theory (qualitative) –Applications of superconductors. Physics of Nanomaterials:  Introduction - Significance of nanoscale - Surface area and quantum confinement –Synthesis of nanomaterials: ball mill, chemical vapour deposition, sol-gel, plasma arcing –applications of nano materials

**TEXT BOOKS:**
1. *Engineering Physics* – K.Thyagarajan, 5th Edition, MacGraw Hill Publishers, NewDelhi, 2014.
2. *Engineering Physics* - Gaur R.K. and Gupta S.L. Dhanpat Rai Publishers, 2009

**REFERENCES:**

1.  *Engineering Physics* - Mani Naidu S.,Pearson Publications, 2011.
2.  *Engineering Physics* - Arumugam K.-PHI Learning Pvt., India, 2009.
3.  *Engineering Physics* -Palanisamy P.K, SCITECH Publications, 2011.
4.  *Engineering Physics* -Rajagopal K. PHI, New Delhi, 2011.
5.  *Engineering Physics* – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10th Edition,S.Chand and Company, New Delhi, 2014

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**(16CS501) COMPUTER PROGRAMMING**
**(Common to all Branches)**

**Course Objectives:**
• To understand the core aspects of computer problem solving techniques
• To understand the programming language constructs
• To understand the programming paradigms

**Course Outcomes:**
• Able to design the flowchart and algorithm for real world problems
• Able to learn and understand new programming languages
• Able to construct modular and readable programs
• Able to write C programs for real world problems using simple and compound data types

**UNIT I**
**OVERVIEW OF COMPUTERS AND PROGRAMMING**: Electronic Computers Then and Now – Computer Hardware - Computer Software - Algorithms - Flowcharts - Software Development Method - Applying the Software Development Method. C Language Elements- Variable Declarations & Data Types Executable Statements – General form of a C Program- Expressions - Precedence and Associativity- Operators and Expression – Type Conversions

**UNIT II**
**DECISION STATEMENTS:** If Statement, If-else Statement, Nested- If-else Statement, Else if Ladder, Switch case – break – continue – go to Statements – Example Programs Loop Control Statements – for loop – while loop - do while – Example Programs

**UNIT III**
**ARRAYS:** Declaring and referencing Arrays – Array Subscripts, Using for loops for sequential access – Using Array elements as Function arguments – Array arguments – Multidimensional Arrays – Example Programs
**STRINGS:** Introduction – Declaring and Initializing String variables – Reading Strings from Terminals – Writing Strings to Screen – Arithmetic Operations on Characters – Putting Strings together – Comparison of two Strings – String Handling Functions – Table of Strings- Other Features of Strings.

**UNIT IV**
**FUNCTIONS:** Definition – Function without Arguments – Functions with input arguments – Functions with simple output parameters – Communication among Functions – Scope – Storage clauses – Type Qualifiers – Recursion
**Pointers:** Introduction – Understanding Pointers – Accessing the address of a variable – Declaring Pointers variables- Initialization of Pointer variables – Accessing a variable through its Pointer – Chain of Pointers – Pointer Expressions – Pointer Increment & Scale Factors – Pointers and Arrays – Pointers and Character Strings – Array of Pointers – Pointers as Function Arguments .- Function returning Pointers – Pointers to Function.

**UNIT V**

**STRUCTURES:** Introduction – Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization – Copying and Comparing Structure variables – Operations on Individual members – Arrays of Structures – Arrays with in Structures – Structures with in Structures – Structures and Functions – Unions –Bit fields – TYPEDEF – ENUM

**File Management in C:** Introduction – Types of Files – Defining and Opening a File – Closing a File – Input / Output Operations on Files – Error handling during IO Operations – Random access to files – Command line arguments. Preprocessor - #define and #include.

**TEXT BOOKS:**
1. Programming in C and Data Structures – Jeri R. Hanly, Elliot B Koffman, Ashok Kamthane, A Anand Rao – Pearson.(UNITS I, II and III)
2. Programming in C and Data Structures – E Balagurusamy - McGrawHill

**REFERENCES:**
1. Computer Fundamentals and C Programming - Dr. P. Chenna Reddy, ISBN: 9789351045885, Publisher: Pothi.com
2. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
3. "C from Theory to Practice"- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
4. "Programming with C"- R S Bichkar- University Press.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)

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**(16HS606) HUMAN VALUES AND PROFESSIONAL ETHICS**
**(Common to CE, EEE & ME)**

**Course Objectives:**
- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

**Course Outcomes:**
Students undergoing this course are able to
- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

**UNIT I**
**Human Values -** Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

**UNIT II**
**Engineering Ethics -** Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

**UNIT III**
**Engineering As Social Experimentation** - Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

**UNIT IV**
**Safety, Responsibilities And Rights**- Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk
Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

**UNIT V**
**Global Issues**-Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility

**TEXTBOOKS:**
1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

**REFERENCES:**
1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

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**I B. Tech. – I Sem. (CE)**                                        **P        C**
                                                                                        **4        2**

## (16HS608) ENGINEERING PHYSICS LABORATORY
### (Common to CE, EEE & ME)

**Course Objectives:**

- Will recognize the important of optical phenomenon like interference and diffraction.
- Will understand the role of optical fibre 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 application of B-H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms 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.

**Course Outcomes:**

- Would recognize the importance of optical phenomenon like interference and diffraction.
- Would have acquired the practical application knowledge of optical fibre, 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.

**Any 10 of the following experiments has to be performed during the I year II Sem.**

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. Determination of the 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 nano material by any suitable method.

**REFERENCES:**

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

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**(16CS502) COMPUTER PROGRAMMING LAB**
**(Common to all Branches)**

**Course Objectives:**
- To make the student learn C Programming language.
- To make the student solve problems, implement those using C & C++ programming languages.
- To strengthen the ability to identify and apply the suitable data structure for the given real world problem.

**Course Outcomes:**
At the end of the course, students will be able to
- Apply problem solving techniques of C to find solution.
- Use C language features effectively to implement solutions.
- Use C++ language features effectively to solve problems.
- Identify and develop apt searching and sorting technique for a given problem.
- Identity, design and develop the appropriate data structure for a given problem or application.

**LIST OF EXPERIMENTS/TASKS:**
1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. 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.
3. Write a program to find the roots of a Quadratic equation.
4. Write a program to compute the factorial of a given number.
5. Write a program to check whether the number is prime or not.
6. Write a program to find the series of prime numbers in the given range.
7. Write a program to generate Fibonacci numbers in the given range.
8. Write a program to find the maximum and minimum of a set of numbers.
9. Write a program to reverse the digits of a number.
10. Write a program to find the sum of the digits of a number.
11. Write a program to find the sum of positive and negative numbers in a given set of numbers.
12. Write a program to check for number palindrome.
13. Write a program to evaluate the sum of the following series up to n terms
    $$e^x = 1 + x + x2/2! + x3/3! + x4/4! + \text{--------}$$
14. Write a program to generate Pascal Triangle.
15. Write a program to read two matrices and print their sum and product in the matrix form.
16. 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.
17. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.

18. 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.

19. 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.

20. Write a program to merge two files.

21. Write a program to read a set of strings and sort them in alphabetical order.

22. 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.
    <div>
    i.    String length determination          ii .Compare Two Strings<br>
    ii.    Concatenate them, if they are not equal    iv. String reversing
    </div>

23. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.

24. Write a program to exchange two numbers using pointers.

25. Write a program to read student records into a file. Record consists of roll no, 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.

26. A file consists of information about employee salary with fields employee id, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employee id, 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 are user specified. Compute the Gross and Net salary of the employee and update the file.

27. Write a program to perform Base (decimal, octal, hexadecimal,…) conversions.

28. Write a program to find the square root of a number without using built-in library function.

29. Write C program to convert a string to number.

30. Write C program to generate multiplication tables from 11 to 20.

**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.

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**(16ME301) ENGINEERING & IT WORK SHOP LAB**
**(Common to CE, EEE & ME)**

**Course Educational Objectives:**

**ENGINEERING WORKSHOP**
- The course provides hands-on training in the trades of Carpentry, Fitting, House-wiring, Tin Smithy, Foundry. Overview of metal cutting processes, plumbing and welding is provided through live demonstrations.

**IT WORKSHOP**
- This course deals with practice sessions on PC hardware, Internet, World Wide Web, MS-Word, Excel, Power Point and Publisher. Demonstrations on installations of system software such as MS-Windows, Linux and device drivers, hardware and software troubleshooting, and protecting the personal computer from viruses and other cyber-attacks are include.

**Course Outcomes:**
**ENGINEERING WORKSHOP**
After completion of this course, a successful student will be able to :
- Utilize workshop tools for engineering practice.
- Employ skills for the production a component for real time applications.
- Appreciate the hard work and intuitive knowledge of the manual workers.
**IT WORKSHOP**
After completion of this course, a successful student will be able to:
- Can install the softwares in the computers
- Utilize skills for the development of application softwares
- Can protect personal computer from virus and other cyber attacks

**LIST OF EXPERIMENTS**

**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  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 gauge G.I. sheet.

**d**. **House-wiring**: Two jobs (exercises) from: Wiring for ceiling rose and two lamps (bulbs) with independent switch, two way switch, controls with or without looping, wiring for stair case lamp, wiring for 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. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.
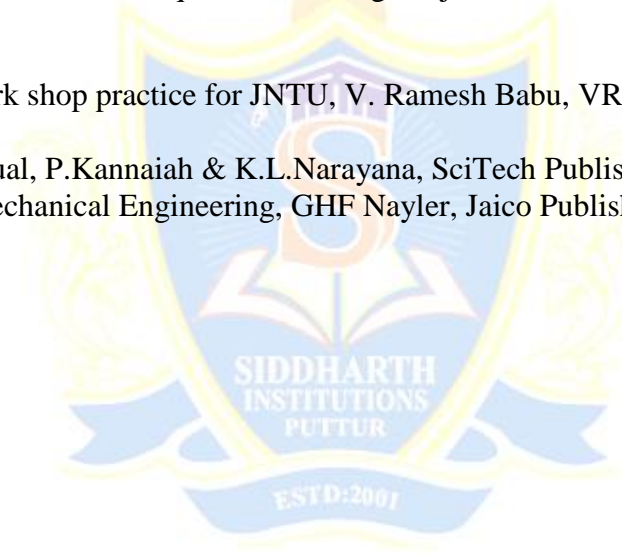
## IT WORKSHOP

<u>**LIST OF EXPERIMENTS**</u>

1. Preparing your Computer Knowledge (5 weeks)

**2. 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.

**3. 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.

**4. 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.

**5. 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.

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

**6.1 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. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

**6.2 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.

**7. Antivirus:** Students should download freely available Antivirus software, install it and use itto 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

**8. Productivity tools** (6 weeks)

**8.1 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.

**8.2 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.

**8.3 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.

**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
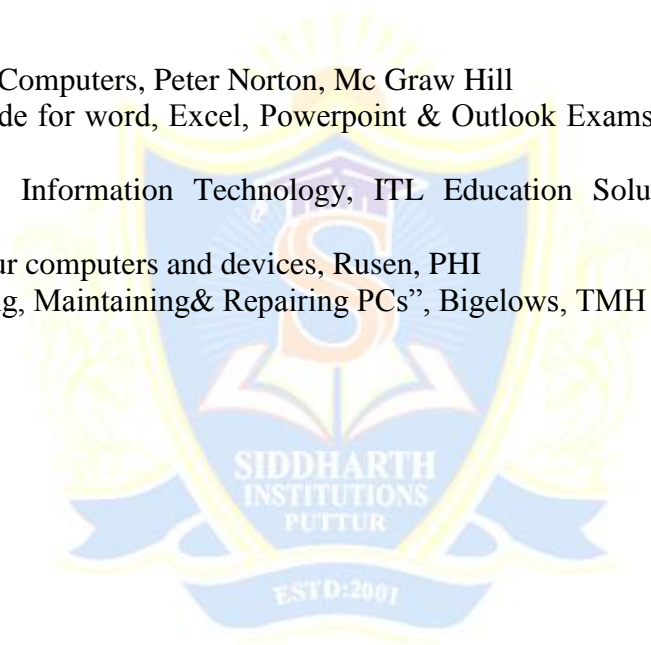
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**(16HS610) PROFESSIONAL ENGLISH**
**(Common to All Branches)**

**Course Description**: The course content focuses on LSRW skills and vocabulary building to enrich their command over language. Relevant task based activities are also carried out to enhance their communication skills.

**Course Objectives**:
- To develop communication skills among the students
- To construct proficiency in academic and social purpose.
- To improve their grammatical accuracy.
- To understand LSRW skills and inculcate the habit of reading for pleasure.

**Course Outcomes:**
Students will be able to
- Use LSRW skills through the prescribed text and develop their ability to communicate effectively.
- Articulate well among themselves and with Faculty.
- Construct compound sentences using common conjunctions.
- Manage to organize and deliver oral presentations.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively

**UNIT I**
**MINDSCAPES (Lessons From the past: Importance of the Past)**
1. Learning English Language through Literature (*Playing the English Gentleman* M.K.Gandhi)
2. Oral presentation
3. Effective writing
    Grammar:  Relative clauses-Adjectives
    Vocabulary: Sequencing words
    Listening & Reading Activities
    Writing: Analytical paragraph writing-Minutes of meeting

**UNIT II**
**MINDSCAPES (Energy: Renewable and Non-renewable Sources - Alternative Sources)**
1. Learning English Language through Literature. (*The Portrait of a Lady* -Kushwant Singh)
2. Preparing and presenting slides, Telephone etiquette
3. Making drafts
    Grammar: Adverbs - prepositions -cause and effect expressions
    Vocabulary: phrasal verbs - Technical vocabulary-Extended definitions
    Listening & Reading Activities
    Writing: Report writing

**UNIT III**
**MINDSCAPES (Engineering Ethics:    Biotechnology - Protection from Natural Calamities)**
1. Learning English Language through Literature (*La Belle Dame Sans Mercy*-John Keats)
2. Poster presentation, Debate
3. Technical drafting
    Grammar: Using connectives-Gap filling exercise using appropriate tense form
    Vocabulary: Acronyms & Abbreviations
    Listening & Reading Activities
    Writing: Writing projects

**UNIT IV**
**MINDSCAPES (Travel and Tourism: Atithi Devo Bhava- Tourism in India)**
1. Learning English Language through Literature (*A Marriage Proposal*-Anton Chekov)
 2. Group Discussion
3. Reading comprehension
    Grammar: Structure indicating purpose-Subject-verb agreement
    Vocabulary: emoticons-cloze test
    Listening & Reading
    Writing:  Intensive and extensive

**UNIT V**
**MINDSCAPES (Getting Job Ready: SWOT Analysis- Preparing for Interviews)**
1. Learning from Literature (*Bird Sanctuary* -Sarojini Naidu)
2. Interview etiquette
3. Job application
    Grammar: Spotting errors, Gap filling exercises using "gerunds" & present participle
                forms
    Vocabulary: verbal ability
    Listening & Reading Activities
    Writing: Covering letter, Resume, Curriculum vitae
    Convincing others

**TEXT BOOKS:**
   1.  *Mindscapes*: *English for Technologists and Engineers*, Orient Blackswan, 2014
   2.  *Paths to Progress in English:* Orient Black Swan

**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.

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**(16HS611) ENGINEERING MATHEMATICS-II**
**(Common to all Branches)**

**Course Objectives:**
- To train the students thoroughly in Mathematical concepts of Matrices, Vector calculus, Fourier series, Fourier transforms and Partial differential equations
- To prepare students for lifelong learning and successful careers using mathematical concepts of Matrices, Vector calculus, Fourier series, Fourier transforms and Partial differential equations
- To develop the skill pertinent to the practice of the mathematical concepts including the Student abilities to formulate and modeling the problems, to think creatively and to Synthesize information

**Course Outcomes:**
- The students become familiar with the application of Matrices, Vector calculus, Fourier series, Fourier transforms and Partial differential equations
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems with engineering applications

**UNIT I**
**MATRICES:** Rank of a matrix, Echelon form, Normal form, Consistency of system of linear equations (Homogenous and Non-homogeneous), Eigen values, Eigen vectors, Cayley Hamilton theorem (Only statement) and its applications. Quadratic forms, Diagonolization.

**UNIT II**
**VECTOR CALCULUS:** Gradient, Divergence, Curl of a vector and related properties, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems (Only statement) and its applications.

**UNIT III**
**FOURIER SERIES:** Determination of Fourier coefficients- Fourier series- Even and odd functions, Fourier Series in an arbitrary interval, Periodic function, Half range sine and cosine series, Harmonic Analysis.

**UNIT IV**
Fourier integral theorem (only statement), Fourier sine and cosine integrals. Fourier transform, Fourier sine and cosine transforms, properties, Inverse transforms, Finite fourier transforms.

**UNIT V**
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, Method of separation of variables, Solution of one dimensional wave equation, Heat equation and two dimensional Laplace equation under initial and boundary conditions.

**TEXT BOOKS:**
1. *Higher Engineering Mathematics,* B.S.Grewal, Khanna publishers
2. *Engineering Mathematics Volume-I,* by T.K.V. Iyengar, S.Chand publication
3. *Mathematical Methods* by T.K.V. Iyengar, S.Chand publication

**REFERENCES:**
1. *Engineering Mathematics*, Volume - I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher 1st Edition (2010)
2. *Fourier Series and Integral Transforms*, by S.Sreenadh & S. Ranganatham, S.Chand Publication (2014)
3. *Engineering Mathematics*, Volume - I, by G.S.S.Raju, CENGAGE publisher.(2013)
4. *Advanced Engineering Mathematics*, by Erwin Kreyszig, Wiley India-10th Edition (2012)
5. *Advanced Engineering Mathematics*, by Erwin Kreyszig, Wiley India-10th Edition (2012)
6. *Higher Engineering Mathematics*, by B.V.Ramana, Mc Graw Hill publishers (2008)
7. *Advanced Engineering Mathematics*, by Alan Jeffrey, Elsevier-1st Edition (2001)

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**(16HS604) ENGINEERING CHEMISTRY**
**(Common to CE, EEE & ME)**

**Course 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.

**Course 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.
- Understand characteristics and applications of fuels and Lubricants.

**UNIT I**
**ELECTROCHEMISTRY, CELL & CORROSION:** Electrolytes- Strong and Weak electrolytes- Definition- examples. Electrolysis - Industrial applications of electrolysis. Cell- Galvanic cell, Batteries- Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuels cells - (Hydrogen-Oxygen and Methanol-Oxygen). 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), electroplating (Copper, nickel and chromium) and electroless plating ( Copper and nickel).

**UNIT II**
**WATER AND ITS TREATMENT:** Hardness of water and its Units, Estimation of hardness by EDTA method.
Troubles of Boilers: Scale & Sludge, Priming and Foaming, 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.

## UNIT III
**FUEL TECHNOLOGY AND LUBRICANTS:** Fuel Technology- Introduction, classification, characteristics of a good fuel, calorific value, liquid fuels, petroleum, refining of petroleum, knocking, octane number, cetane number, power alcohol, synthetic petrol, gaseous fuels, important gaseous fuels.

Lubricants – Definition, functions of lubricants, mechanism of lubrication, properties of lubricants – viscosity, flash and fire points, cloud and pour points, aniline points, neutralization number and mechanical strength.

## UNIT IV
**POLYMERS:** Introduction- Basic concepts of polymerization, types of polymerization (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.

Conducting polymers- mechanism, synthesis and applications of polyacetyline, polyaniline.
Inorganic polymers: Basic introduction, silicones, polyphospazines applications.

## UNIT V
**ENGINEERING MATERIALS:** Cement- composition of Portland cement, preparation (dry and wet process) setting and hardening of cement.

Refractories – introduction, classification, properties and applications.

Nanomaterials – Introduction-Carbon Nano Tubes, Fullerenes. Semi conductors, superconductors and quantum dots.

## 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 Enigneering Chemistry*, 15th Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

## REFERENCES:
1. *A Text book of Engineering Chemistry*, 12th Edition, SS Dhara, Uma, S. Chand Publications, New Delhi, 2010.
2. *Engineering Chemistry*, First edition, Chandra Sekhar K B, Das U N and Sujatha Mishra, SCITECH Publications India Pvt. Limited, 2010.
3. *Engineering Chemistry*, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson
   Education, 2013.
4. *Concise Inorganic Chemistry,* 7th Edn, Lee J.D., Blackwel Science Publications Oxford, London, 2004.

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### (16ME302) ENGINEERING GRAPHICS
### (Common to CE, EEE & ME)

**Course Objectives:**
- To familiarize the students in basic concept of conic sections, projections and developments of Objects.
- To develop the imagination and drafting skills of students.

**Course Outcomes:**
Students undergoing this course are able to
- Frame ideas based on the conceptual modeling and design
- Provide good understanding of the methods involved in preparing various views in engineering drawings
- Can prepare 2D and 3D diagrams of various objects

**INTRODUCTION** (**Not to be included for examination**)
Drawing instruments and their use – Lettering - Dimensioning – Simple Geometrical constructions.

**UNIT I**
**CONIC SECTIONS:** Construction of Ellipse, Parabola, Hyperbola (General and special methods). Special Curves: Cycloids, Involutes.

**UNIT II**
**POINTS:** Projections of points
**LINES:** Projections of straight lines - Determination of true lengths and true inclinations – line inclined to both reference planes., traces.

**UNIT III**
**PLANES:** Projections of planes – Surface inclined to both reference planes
**SOLIDS:** Projections of simple solids (Prisms, pyramids, cylinder and cone) - Axis inclined to both the planes.

**UNIT IV**
**SECTIONS:** Sections of solids (prisms, pyramids, cylinder and cone) in simple vertical position by using cutting plane inclined to one reference plane and perpendicular to the other – true shape of the section.
**DEVELOPMENTS:** Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinder and cone.

**UNIT V**
**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS:** Principles of Isometric projection- Isometric Scale- Isometric Views- Conversion of Isometric to orthographic views– Isometric projection of simple solids (Cube, Cylinder and Cone)
**INTERPENETRATION/INTERSECTIONS OF SOLIDS:** Simple solids.
**COMPUTER AIDED DRAFTING**: Introduction to drafting packages - orthographic views and projections and Isometric projections (demonstration only)

**TEXT BOOKS:**
1. *Engineering Drawing*, N.D.Bhatt, Charotar Publishers
2. *A text Book of Engineering Drawing*, K.L.Narayana, Kannaiah, Scitech Publishers,   2010
3. *Engineering Graphics with using AutoCAD,2007*. Jeyapoovan.T, Vikas Publishing House

**REFERENCES:**
1. *Fundamentals of Engineering Drawing*, Warren J.Luzadder  and  Jon.  M.Duff Prentice Hall of India Pvt., Ltd., Eleventh Edition, 2001.
2. *Engineering  Graphics,* Bhattacharyya,  S.C.Bera, I.K  .International  Pvt Ltd. 2009.
3. *A text Book of Engineering Drawing and Graphic,*  K.Venugopal New Age Publishing New Delhi, 2008,

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**(16CE101) ENGINEERING MECHANICS**
**(Common to CE & ME)**

**Course Objectives:**
- *To learn about forces and force systems and their applications.*
- *To learn about friction and to use the concept of Friction.*
- *To learn how to find centroid and Moments of Inertia of different objects using mathematical formula.*
- *To learn about rectilinear and curvilinear motions of bodies.*

**Course Outcomes:**
*Students undergoing this course are able to*
- *Construct free body diagrams and develop appropriate equilibrium equations.*
- *Understand the concepts of friction and to apply in real life problems.*
- *Determine the centroid and Moment of Inertia for composite sections.*
- *Understand the dynamic analysis of rigid body motion.*

**UNIT-I**
**BASICS:** Fundamental Principles – Resolution and Composition of Forces and Equilibrium of Particles – Principle of transmissibility – Free body diagram – Equilibrium of Rigid Body.
**FORCES AND FORCE SYSTEMS**: Types of force systems – Resultant of coplanar, concurrent and non-concurrent force systems – Concepts of moment – varignon's theorem.
**EQUILIBRIUM OF SYSTEM OF FORCES**:
Equilibrium concepts in mechanics – Free body diagram – Equilibrium of coplanar force systems – types of members and supports – support reactions.

**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-Ladder Friction.

**UNIT-III**
**CENTROID**&**CENTRE OF GRAVITY:** Centroids of simple figures (from basic principles) – Centroids of Composite Figures Centre of gravity of simple body -center of gravity of composites (simple Problems only).
**AREA MOMENT OF INERTIA:** Definition – Parallel axis and Perpendicular theorems – Polar Moment of Inertia – Radius of gyration – Moment of inertia of basic shapes, Composite Section and simple solids.

**UNIT-IV** `
**ANALYSIS OF PERFECT FRAMES:** Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, and methods of sections for vertical loads, horizontal loads and inclined loads.

**UNIT-V**

**KINEMATICS:** Introduction to Dynamics - Rectilinear and Curvilinear motion – Displacement, Velocity and Acceleration – Motion of a Rigid Body.

**KINETICS:** Bodies in rectilinear translation – Curvilinear translation - D'Alembert's Principle - Principle of Work and Energy – Principle of Impulse and Momentum- (Simple Problems only).

**TEXT BOOKS**:
1. *A Textbook of Engineering Mechanics (As per the latest Syllabus JNTU, Anantpur)*, 3rd Edition, Bhavikatti S S, New Age International, 2016.
2. *Engineering Mechanics*, Dr. R. K. Bansal, 4th Edition, Laxmi Publications, 2011.

**REFERENCES:**
1. *Engineering Mechanics,* D.S. Kumar, 3rd Edition, S.K. KATARIA & SONS
2. *Singer's Engineering Mechanics: Statics and Dynamics*, 3rd Edition, K. Vijaya Kumar Reddy, J. Suresh Kumar, B.S. Publications, 2011.
3. *Engineering Mechanics: Statics*, 6th Edition, J L Meriam, L G Kraige, Wiley India Pvt. Ltd, 2001.
4. *Engineering Mechanics: Dynamics*, 6th Edition, J L Meriam, L G Kraige, Wiley India Pvt. Ltd, 2010.

## SIDDHARTH INSTITUTE OF ENGINEERING &TECHNOLOGY
### (AUTONOMOUS)

**I B. Tech. – II Sem. (CE)**                     **P     C**
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### (16HS607) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
### (Common to CE, EEE & ME)

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.

**Course 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 in both formal and informal situations.
- To enhance written communication among the students.

**Course outcomes:**
- To become active participants in the learning process and acquire proficiency in spoken English.
- To speak with clarity and confidence thereby enhances employability skills.
- To prepare effective job application

**UNIT I**
1. Phonetics -Importance
2. Introduction to Sounds of Speech
3. Vowels and Consonant sounds
4. Phonetic Transcription

**UNIT II**
5. Word Stress
6. Syllabification
7. Rules of Word Stress
8. Intonation

**UNIT - III**
9. Situational Dialogues/ Role Play
10. Telephonic Communication
11. JAM

**UNIT IV**
12. Describing Persons/ places/ things
13. Oral Presentations
14. Debate

**UNIT V**
15. Group Discussion
16. Job application
17. Interview skills

**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 2nd Ed T. Balasubramanian. Macmillian), 2012

2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd

3. Speaking English Effectively, 2nd 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.

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**(16HS609) ENGNEERING CHEMISTRY LAB**
**(Common to CE, EEE & ME)**

**Course Objectives:**
- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes:**
On completion of this course, students will have the knowledge in.
- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

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

**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.

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**I B. Tech. – II Sem. (CE)**                                          **P      C**
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**(16CE102) APPLIED MECHANICS LAB**
**(Common to CE & ME)**

**Course Objective:**
- *To learn about polygon law of forces.*
- *To learn about Static friction and its concepts.*
- *To learn how to find centroid and Moments of Inertia of an objects.*
- *To learn about single and double Gear Crab.*

**Course Outcomes:**
*Students undergoing this course are able to*
- *Understand different laws of forces.*
- *Understand concepts of support reaction.*
- *Fundamentals of applied mechanics.*
- *Understand concepts of different types of pendulum.*

**LIST OF EXERCISES:**
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.
          **\*Minimum Eight experiments** must be conducted in the lab session.

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**(16HS612) ENGINEERING MATHEMATICS-III**
**(Common to all branches)**

**Course Objectives:**
- To train the students thoroughly in Mathematical concepts of Complex Analysis, Interpolation, Curve fitting, Numerical Differentiation and Integration and their applications
- To prepare students for lifelong learning and successful careers using mathematical concepts of Complex Analysis, Interpolation, Curve fitting, Numerical Differentiation and Integration and their applications
- 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
.
**Course Outcomes:**
At the end of the course, students would be expected to:
- Have acquired ability to participate effectively in group discussions
- Have developed ability in writing in various contexts
- Have acquired a proper level of competence for employability
- Have acquired computational skills to solve real world problems in engineering

**UNIT I**
**COMPLEX ANALYSIS-I:** Analytic functions, Cauchy– Riemann equations, complex integration, Cauchy's theorem, Integral formula, Evaluation of Integrals.

**UNIT II**
**COMPLEX ANALYSIS-II:** Singularities, poles, Residues, Residues theorem, Evaluation of real integrals of the types $\int_{0}^{2\pi} f(\cos\theta, \sin\theta)d\theta$, $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ - conformal mapping – Bilinear transformations- Transformation of $e^z$, $Z^2$, Sin z, and Cos z.

**UNIT III**
**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:** The Bisection Method, The Method of False Position, Newton-Raphson Method.
**INTERPOLATION:** Newton's forward and backward interpolation formula, Lagrange's interpolation formula.

**UNIT IV**
**CURVE FITTING:** Fitting of a straight line, Second degree curve, Exponential curve, Power curve by method of least squares.
**NUMERICAL DIFFERENTIATION AND 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 second and fourth order methods.

**TEXT BOOKS:**
1. *Higher Engineering Mathematics,* B.S.Grewal, Khanna publishers.
2. *Advanced Engineering Mathematics,* Peter V.O'Neil, CENGAGE publisher.

**REFERENCES:**
1. Engineering *Mathematics III* by T.K.V. Iyengar, S.Chand publications.
2. *Mathematical Methods* by T.K.V. Iyengar, S.Chand publications.
3. *Engineering Mathematics, Volume - III*, E. Rukmangadachari & E. Keshava Reddy Pearson Publisher.
4. *Advanced Engineering Mathematics* by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, and Oxford.

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### (16EE209) ELECTRICAL & MECHANICAL TECHNOLOGY

**Course Objectives:**
- To understand the basic fundamentals in Electrical Circuits.
- To study the construction, Principle of operation and performance of DC machine, AC machines and Transformer.
- To understand the principles of measuring instruments.

**Course Outcomes:**
- After completion of the course the student will be able to
- Understand the fundamentals of electrical circuits.
- Acquire the concept of all types of Electrical Machines like DC, AC, machines and Transformer.
- Know the principle of measuring instruments.

## PART – A ELECTRICAL TECHNOLOGY

### UNIT-I
**FUNDAMENTALS OF ELECTRICAL QUANTITIES - MEASUREMENTS:**
Definition for Conductor, Insulator & semi-Conductor - Basic Electrical Quantities and their units - Ohm's law - Resistance in series, parallel and series - parallel combinations - Units of work, power and energy. Calculation of Electricity bill for different types of consumers - Active and Passive circuits - Junction, branch and loop in circuits, Kirchhoff's laws - Star - Delta configurations, star-delta transformations - Classification of measuring Instruments - Types of MI& MC Instruments - Definitions of accuracy, precision, error, resolution and sensitivity - types of errors.

### UNIT-II
**ELECTRICAL DOMESTIC WIRING - HAZARDS, FIRST-AID & SAFETY PRECAUTIONS:**
Electrical Symbols - Size of wires & cables for domestic & Power loads - Types of Wires & Cables - Types & installation of House Wiring Systems & Accessories: Surface conduit wiring, CTS Wiring, Concealed Wiring, and PVC conduit wiring - Comparison of various wiring systems - Distribution fuse boards - Main switches – Different types of fuses and fuse carriers - Safety procedures - Electric shock and first aid, causes for fire hazards in Electrical installations - Requirements of good lighting different types of lamp fittings laws of illumination.

**UNIT-III**
**ELECTRICAL INSTALLATION & ESTIMATION:**
Electrical installation testing - departmental procedure for testing before giving service connection - departmental procedure for obtaining service connection - Estimation of domestic lighting installation service main - types of wire - specification - quantity of materials required for service main – estimation and selection of interior wiring system suitable to a given building - number of circuits - calculation of length of wire and quantity of accessories required - estimates of materials for execution of the domestic wiring installation as per National Electrical act 2003 . Power wiring installation & drawing wiring layout for a big office building, electrical laboratory, big industry, big hotel with lift arrangement and a residential building with 2 bed room house. - estimation and costing upto 20 kVA calculation of load current based on ratings of various equipment's to be installed.

## PART – B MECHANICAL TECHNOLOGY

**UNIT IV**
**Classification of IC Engines**. - 4 stroke and 2 stroke engines comparison –Types of Air Compressors –working of air compressors. Simple vapor compression refrigeration system–Types of air conditioning systems-window air-split–. Central–packaged air conditioner–Ducting –Different types of ventilation system.

**UNIT V**
Transmission of power, Belt, Rope, Chain and gear drive-simple problems. Earth moving machinery and Mechanical handling equipment – bull dozers – power showels – Excavators – concrete mixer –Belt and bucket conveyers.

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

**TEXT BOOKS:**
1. Electrical Technology, B.L. Theraja, S. Chand Publishers.
2. Elements of Mechanical Engineering by S.N. Lal, Cengage Learning, 2013
3.  Mechanical Technology, Khurmi.

**REFERENCES:**
1. Mechanical Technology, Kondandaraman C.P.
2. Construction Planning, Equipment and methods – Purify.
3. Introduction to Electrical Engineering, M.S. Naidu & S. Kamakshaiah, TMH

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**II B.Tech. - I Sem. (CE)**                          **L    T    C**
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**(16CE103) STRENGTH OF MATERIALS – I**

**Course Objectives:**
- To learn about simple stresses and strains and their applications
- To learn how to find shear force and bending moment and construction of SFD & BMD
- To understand about the concept of simple bending and shear stress distribution
- To learn about deflections of Beams by using different methods
- To learn about columns and struts and their applications

**Course Outcomes:**
Students undergoing this course are able to:
- The students would be able to understand the behaviour of materials under different stress and strain conditions
- 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
- The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams under various loading conditions
- Determine shear stress in the shaft subjected to torsional moments

**UNIT-I**
**SIMPLE STRESSES AND STRAINS:** Elasticity and plasticity – Types of stresses and strains – Hooke's law– Factor of safety- 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 MOMENTS**: Types of supports and beams – Shear force and bending moment diagrams for cantilever, simply supported and over hanging beams with point loads, uniformly distributed load, uniformly varying loads and couples – Relationship between bending moment, shear force and loading.

**UNIT-III**
**THEORY OF SIMPLE BENDING**: Assumptions in the theory of simple bending – Derivation of bending equation: $M/I = f/y = E/R$ –Neutral axis – Determination bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam.

**SHEAR STRESS DISTRIBUTION**: Derivation of formula – Shear stress distribution in rectangular, triangular, circular, I and T sections.

**UNIT-IV**
**DEFLECTIONS OF BEAMS:** Differential equation of deflected beam – Slope and deflection at a point - Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, UDL and uniformly varying load- Mohr's theorems – Moment area method – application to simple 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.
**TORSION OF CIRCULAR SHAFTS AND SPRINGS:** Theory of pure torsion - Torsional theory applied to circular shafts – Power transmission - Close and open coiled helical springs under axial loads and axial twist – Carriage springs.

**TEXT BOOKS:**
1. *Strength of Materials (Mechanics of Solids)*, 6th Edition, Er. R.K. Rajput, S. Chand Publishing
2. *A Textbook of Strength of Materials*, 6th Edition, Dr. R. K. Bansal, Laxmi Publications

**REFERENCES:**
1. *Mechanics of Materials*, Revised, 2016 Edition, Dr. B. C. Punmia, Er. Ashok Kr. Jain, Dr. Arun Kumar Jain, Laxmi Publications
2. *Strength of Materials*, 3rd Edition, R. Subramanian, Oxford University Press
3. *Strength of Materials*, 24th Edition, R. S. Khurmi, S. Chand Publishing
4. *Strength of Materials*, 11th Edition, Sadhu Singh, Khanna Publishers

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**(16CE105) SURVEYING**

**Course Objectives:**
- To train the students on the basic principles of surveying for the measurement of distances and areas
- To measure bearing of a line with prismatic compass and horizontal angles between the lines and vertical angles of elevated or depressed objects by transit theodolite
- To apply for horizontal and vertical distance computation by tachometry survey
- To set out different types of curves in the field

**Course Outcomes:**
- be in a position to apply the basic principle of surveying and usage of surveying instruments in all civil engineering activities, including the construction of buildings, bridges, roads and high ways, pipe lines, dams, ports and harbours
- be an expert of demarcation of ownership and / or delimitation of land, property, etc. through surveying process
- surveying techniques to collect data for planning, designing and execution, able to employ green field
- use total station and able to assess the electromagnetic distances

**UNIT – I**
**PRINCIPLES OF SURVEYING:** Surveying – Definition; primary divisions, classification - Principles of surveying - Scales used for maps and plans - Duties of a surveyor - Errors: accuracy and precision - Sources and types of errors.
**ANGLES, AZIMUTHS AND BEARINGS:** Units of angle measurement - Meridians, azimuths bearings - Magnetic declination, Local attraction and corrections to angles and bearing of lines.
**TYPES OF SURVEYING:** Introduction to Chain, Compass and Plan Table Survey.

**UNIT - II**
**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 - 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 - III**
**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 – Traversing - Omitted measurements - Closing error -

Determination of the level of the top of an object, when its base is accessible and inaccessible - Determination of the height of the object when the two instrument stations are not in the same vertical plane.

**TACHEOMETRIC SURVEYING:** Definitions - Advantages of tachometric surveying - Basic systems of tachometric measurement - 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.

**UNIT - IV**
**CURVES**: Simple curves – Definitions and notations - Designation of a curve - Elements of simple curves - Methods of setting simple curves: Rankine's method, Two theodolite method - Compound curves – Elements of 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.

**TEXT BOOKS:**
1. *Surveying Vol-I*, 16th Edition, Punmia B. C, Laxmi Publications.
2. *Surveying Vol-II*, 15th Edition, Punmia B.C, Laxmi Publications.
3. *Surveying and Leveling*, 2nd Edition, Basak N.N, Tata McGraw Hill Publishing Company Ltd.

**REFERENCES:**
1. *Surveying and levelling part I & II*, 23rd Edition, Kanetkar.T.P. & S.V. Kulkarni, Puna Vidyarthi Girha, Prakashan,
2. *Fundamentals of Surveying and Levelling,* 1st Edition, R. Subramanian, Oxford University Press, India
3. *Surveying Vol-I*, 10th Edition, Arora K. R, Rajsons Publications Pvt. Ltd.

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**(16CE106) FLUID MECHANICS**

**Course Objectives:**
- To understand the basic concepts of Fluid properties and fluid statics
- To understand the applications of fluid kinematics and dynamics
- To understand the behavior of pipe flow and losses in pipe flow
- To understand the concepts of flow measurements and boundary layer flows

**Course Outcomes:**
On completion of the course, the students will be able to:
- determine the properties of fluid like pressure and their measurement.
- compute forces on immersed plane and curved plates.
- apply continuity equation and energy equation in solving problems on flow through conduits.
- compute the frictional loss in laminar and turbulent flows.

**UNIT-I**
**Fluid Properties**: Dimensions and units - Definition of a fluid – Physical properties of fluids-Density, Specific weight, Specific volume, Specific gravity, Compressibility, Vapour pressure, Surface tension and capillarity and viscosity.
**Fluid Statics:** Pascal's law - Pressure variation in a static fluid – Atmospheric, gauge and absolute pressures, Measurement of pressure – Piezometer – U–tube and inverted U–tube manometers and Bourdon's pressure gauge, hydrostatic forces on plane and curved surfaces, center of pressure.

**UNIT-II**
**Fluid Kinematics:** Types of flow – Streamline – Streak line – Path line – Stream tube – Control volume – Continuity equation in one and three dimensional forms – Stream function and velocity potential function – Flow net – Acceleration of a fluid particle – Local and convective accelerations – Tangential and normal accelerations.
**Fluid Dynamics:** Euler's equation of motion along a streamline – Bernoulli's energy equation – Energy correction factor – Impulse momentum equation – Momentum correction factor – Force on a bend – Energy gradient line – Hydraulic gradient line – Analysis of free liquid jets – Forced vortex and free vortex.

**UNIT-III**
**Analysis of pipe Flow:** Forces acting on open pipe and buried pipe, minor losses in pipe flow – Pipes in series and parallel – Siphon – Pipe networks –Velocity distribution for turbulent flow in pipes – Rough and smooth pipes – Darcy Welsbach equation – Variation of friction factor – Moody's chart.

**UNIT-IV**
**Flow Measurement:** Velocity measurement by Pitot tube and Pitot static tube – Discharge measurement by Venturimeter and orifice meter – Orifices and mouthpieces – Flow over rectangular, triangular, trapezoidal and stepped notches - Broad crested weirs.

**UNIT-V**

**Laminar Flow**: Reynolds' experiment – Regimes of flow - Laminar flow, turbulent flow, transitional flow – Reynolds' number – Laminar flow through circular pipes – Hagen Poiseuille equation – Laminar flow through parallel plates - Introduction of Hardy Cross method.
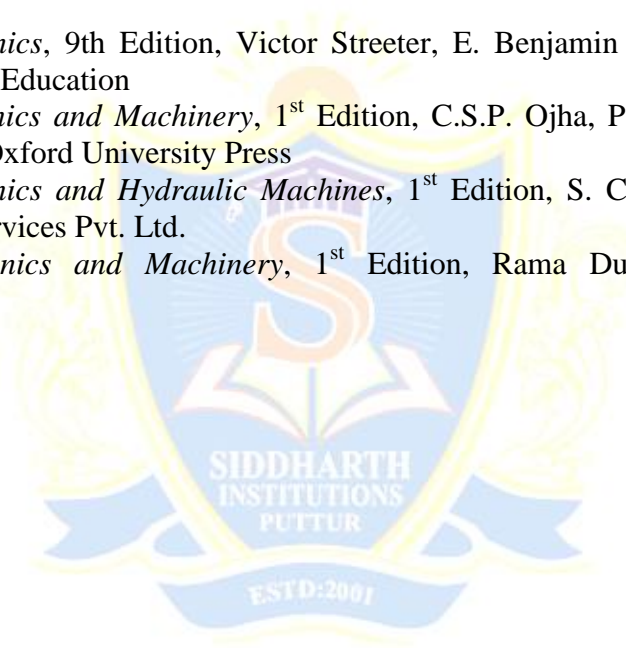
**Boundary Layer Theory**: Concept of boundary layer flow- Boundary layer along a thin flat plate - Boundary layer separation and its control - Flow around submerged objects-Drag and lift.

**TEXT BOOKS:**
1. *Hydraulics and Fluid Mechanics Including Hydraulics Machines (A-4-Size)*, 20th Edition, Dr. P.N. Modi & Dr. S.M. Seth, Standard Book House
2. *A Textbook of Fluid Mechanics and Hydraulic Machines,* 9th Edition, Dr. R. K. Bansal, Laxmi Publications

**REFERENCES:**
1. *Fluid Mechanics*, 9th Edition, Victor Streeter, E. Benjamin Wylie, K.W. Bedford, McGraw Hill Education
2. *Fluid Mechanics and Machinery*, 1st Edition, C.S.P. Ojha, P.N. Chandamouli & R. Berndtsson, Oxford University Press
3. *Fluid Mechanics and Hydraulic Machines*, 1st Edition, S. C. Gupta, Pearson India Education Services Pvt. Ltd.
4. *Fluid Mechanics and Machinery*, 1st Edition, Rama Durgaiah D., New Age International

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### (16CE107) BUILDING MATERIALS & CONSTRUCTION

**Course Objectives:**
- To introduce traditional and modern construction materials.
- To import knowledge of building components.
- To import knowledge of construction practices.

**Course Outcomes:**
On completion of the course, the students will be able to:
- understand properties of various construction materials and their manufacturing process.
- access the quality of construction materials.
- supervise the construction activities.

**UNIT I**
**STONES:** Classification of rocks – Quarrying of stones: tools, methods, precautions – Uses of stones – Characteristics of good building stones.
**BRICKS:** Classification of bricks – Characteristics of good bricks – Ingredients of good brick earth – Harmful substances in brick earth – Manufacturing of bricks – Defects in bricks.
**WOOD:** Classification of trees – Classification of timber – Structure of timber – Characteristics of good timber – Seasoning of timber – Defects, diseases and decay of timber.
**UNIT II**
**CEMENT:** Properties of cement – Composition of ordinary cement – Manufacturing of ordinary cement - field tests on cement – Laboratory tests on cement – Storage of cement.
**PAINTS & DISTEMPERS:** Composition of oil paint – Preparation of paint – Painting plastered surfaces – Painting wood surfaces – Painting metal surfaces – Defects – Distemper – White wash and color wash – Varnish.
**MISCELLANEOUS MATERIALS:** Pig iron – Cast iron – Steel – Glass – Asbestos – Gypsum – Bitumen – Rubber.

**UNIT III**
**FOUNDATION:** Functions of foundation – Requirements of good foundation – Type of foundation – Foundation failures and Remedial measures.
**MASONRY:** Definition of terms used in masonry – Classification of stone masonry – English and Flemish bonds in brick masonry – Defects in brick masonry – Comparison of brick and stone masonry.

**UNIT IV**
**FLOORS:** Components of floor – Types of floors: Cement concrete flooring, mosaic flooring, marble flooring, tiled flooring, timber flooring and rubber flooring.
**ROOFS:** Pitched, flat and curved roofs - Lean-to-Roof, coupled roofs, Trussed roofs- King and queen post trusses - RCC roofs, madras terrace / shell roofs.

**DOORS AND WINDOWS:** Location of doors and windows – Types of doors – Types of windows.

**UNIT V**
**LINTELS & ARCHES:** Classification of lintels – Terms used in arches – Classification of arches.
**PLASTERING AND POINTING:** Types of mortars for plastering – Methods of plastering – Defects in plastering – Pointing.
**STAIRS:** Technical terms – Requirements of good stair – Classification of stairs.

**TEXT BOOKS:**
1. *Building Materials*, 4th Edition, Duggal, S.K., New Age International
2. *Building Construction,* 11th Edition, Dr. B.C. Punmia, Er. Ashok Kumar Jain, Dr. Arun Kumar Jain, Laxmi Publications.

**REFERENCES:**
1. *Engineering Materials [Material Science]*, 42nd Edition, Rangwala, Charotar Publishing House Pvt. Ltd.
2. *A Textbook on Building Construction,* Dr.S.K. Sharma, S. ChandPublishers.
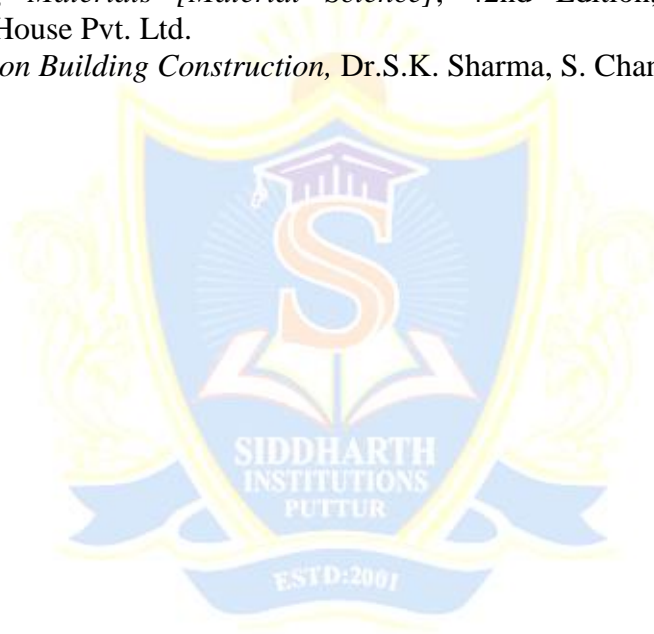
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**(16CE107) SURVEYING LAB-I**

**Course Objectives:**
- To train the students in plotting of land by chain and tape plan   table surveys
- To train the students in determine distance between two inaccessible points by prismatic compass and plane table and the odolite methods
- To train the students in plotting of contour maps by conducting leveling survey and total station and tachometric methods

**Course Outcomes:**
After completion of the course the student will be able to:
- gain knowledge and expertise in operation of various survey instruments for computation of area of a land.
- successfully carry out survey work in all civil Engineering projects, including the construction of buildings, roads and highways, rail track laying with curves, pipe lines, dams, ports and harbor as well as delimitation of land and property, etc.

**LIST OF EXPERIMENTS:**
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. Compound leveling (differential leveling).
9. An exercise of L.S. and C.S. and plotting.
10. Contour survey of reservoir.
11. Contour survey of a highway.

**LIST OF EQUIPMENT:**
1. Chains, tapes, ranging rods, cross staff, arrows.
2. Compasses and Tripods, Optical square.
3. Plane tables, Alidade, Plumbing fork, trough compasses.
4. Leveling instruments and leveling staves.

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**(16CE109) STRENGTH OF MATERIALS LAB**

**Course Objectives:**
- To learn the testing procedures of mild steel by tension, direct shear, torsion, hardness tests
- To learn the concept of modulus elasticity, and to know how to measure deflection of beams
- To learn the compressive strength of wood, concrete stone and bricks
- To learn the testing procedures for burnt clay bricks and comparison with BIS standard of brick

**Course Outcomes:**
After completion of the course the student will be able to:
- estimate Young's modulus, tensional rigidity of mild steel rods
- know the hardness of mild steel and HYSD specimens
- analyze the strength of wood, concrete, stone and bricks
- assess the quality of wood, concrete, stone and bricks

**LIST OF EXPERIMENTS:**
1. Bending test on simple support beam.
2. Compression test on wood or Brick.
3. Impact test on metal specimen (Izod and Charpy)
4. Compression test on helical spring.
5. Tension test on mild steel rod.
5. Torsion test on mild steel rod.
6. Impact test.
7. Shear test.
8. Continuous beam – deflection test.
9. Hardness test on metals (Rockwell and Brinell Hardness Number Tests).
10. Verification of Maxwell's Reciprocal theorem on beams.

**LIST OF EQUIPMENT:**
1. UTM for conducting tension test on rods.
2. Brinnell's/Rock well's hardness testing machine.
3. Compression testing machine.
4. Izod Impact machine.
5. Steel beam for flexure test.
6. Beam setup for Maxwell's theorem verification.
7. Torsion testing machine.

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## (COE-I) COMPREHENSIVE ONLINE EXAMINATION -I

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**(16CS503)  DATA STRUCTURES THROUGH C**
**(AUDIT COURSE)**
**(Common to CE, EEE, ME & ECE)**

**Course Objectives:**
- Understand different data structures
- Understand searching and sorting techniques

**Course Outcomes:**
- At the end of the course, students will be able to:
- Design algorithms to implement various data structures.
- Understand and program stacks and list data structures.
- Write programs to implement different types of queues.
- Understand and make use of hash tables in applications like dictionary, spell checker etc.,
- Understand why height balanced trees are advantageous over other data structures.

**UNIT I**
**INTRODUCTION AND OVERVIEW**:  One Dimensional array- Multi Dimensional array- pointer arrays. **Linked lists**: Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists.

**UNIT II**
**STACKS**:  Introduction-Definition-Representation  of  Stack-Operations  on  Stacks- Applications of Stacks. **Queues**: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues.

**UNIT III**
**TREES**: Basic Terminologies- Definition and Concepts- Representations of Binary Tree- Operation on a Binary Tree- Types of Binary Trees-Binary Search Tree, Heap Trees
**GRAPHS**: Introduction- Graph terminologies- Representation of graphs- Operations on Graphs- Application of Graph Structures: Shortest path problem- topological sorting.

**UNIT IV**
**SORTING** : Sorting Techniques- Sorting by Insertion: Straight Insertion sort- List insertion sort- Binary insertion sort- Sorting by selection: Straight selection sort- Heap Sort- Sorting by Exchange- Bubble Sort- Shell Sort- Quick Sort-Sorting by Mergin: Simple Merging-Binary Merge-Merge Sort.
**UNIT V**
**SEARCHING:** Linear Search Techniques: Linear Search with Array- Linear Search with Linked List- Linear Search with ordered list- Binary Search- Fibonacci Search.
**TABLES**:  Hash Tables: Hashing Techniques- Collision Resolution Techniques- Closed Hashing- Open Hashing.

**TEXT BOOKS:**
1. *Classic Data Structures*, Second Edition by Debasis Samanta, PHI.
2. *Data Structures A Pseudo code Approach with C*, Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.

**REFERENCES:**
1. *Fundamentals of Data Structures in C* – Horowitz, Sahni, Anderson-Freed, Universities Press, Second Edition.
2. *Outlines – Data Structures* – Seymour Lipschutz – McGrawHill- Revised First Edition.
3. *Data structures and Algorithms using C++,* Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

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**(16HS613) PROBABILITY &STATISTICS**
**(Common to EEE, CE, ME & CSE)**

*Course Objectives:*
- *To train the students thoroughly in Mathematical concepts fundamentals of probability, test of hypothesis, Test of significance and ANOVA*
- *To prepare students for lifelong learning and successful careers using mathematical concepts of probability, test of hypothesis, Test of significance and ANOVA*
- *To develop the skill pertinent to the practice of the mathematical concepts including the Student abilities to formulate and modeling the problems, to think creatively and to Synthesize information*

*Course Outcomes:*
*At the end of the course, students would be expected to:*
- *Have acquired ability to participate effectively in group discussions*
- *Have developed ability in writing in various contexts*

*Have acquired a proper level of competence for employability*

**UNIT-I**
**Probability:** Introduction, Conditional probability, Baye's theorem, Random variables, Discrete and continuous Distributions, Expectation, Varience, Moments, Moment generating functions

**UNIT-II**
Distributions, Binomial, Poisson, Normal, Uniform, Exponential and Gamma distributions, related properties and applications

**UNIT-III**
**Test of Hypothesis:** Population and Sample, Confidence interval of mean from Normal distribution, Null and Alternative hypothesis, Level of significance
**Test of significance:** Test based on normal distribution, Z test for means and proportions, 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**
Analysis of variance one way classification and two way classification (Latin square Design and RBD)

**UNIT-V**
**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 X- bar Chart, R-Chart, P-Chart and C-Chart.

**TEXT BOOKS:**

1.  Statistical methods by S.P. Gupta, S.Chand publications.
2. Probability & Statistics by T.K.V. Iyengar, S.Chand publications.

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

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**(16HS605) ENVIRONMENTAL STUDIES**
(Common to All Branches)

**Course Objectives:**
- Students have got an idea about the importance of pollution free air, water, soil and food.
- They know about global environmental problems like Acid Rains, Global Warming, Green House Effects, Ozone layer depletion.
- To understand the impacts of developmental activities and mitigation measures along with the environmental policies and regulations.
- To recognize major concepts in environmental studies and demonstrate in-depth understanding the environment.

**Course Outcomes:**
- Based on this course, the Engineering Student will be able to understand/evaluate/develop technologies on the basis of Ecological principles and environmental regulations along with Legislation, Laws and Policies which in turn help in sustainable development.
- Take preventive measures to reduce air, water, soil pollutions and contaminants in food.
- Effectively carry out waste disposal at individual level.
- Involve in preservation of natural resources.

**UNIT- I**
**INTRODUCTION:**
Definition, Scope and Importance-Need for Public Awareness
NATURAL RESOURCES:
Classification of resources-Forest resources: Use and over-exploitation, deforestation-Mining, dams and their effects on forests 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 –Energy resources: Renewable and Non- Renewable sources of energy- Solar energy, Hydro electrical energy, Wind energy, Nuclear energy, etc.

**UNIT-II**
**ECOSYSTEMS:**
Concept of an ecosystem– structural features of ecosystem- Producers, Consumers and Decomposers–-Biogeochemical cycles- Ecological Succession-Food chains, food webs and ecological pyramids – Energy flow in the ecosystem-Types of ecosystems (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems.

**UNIT-III**
**BIODIVERSITY AND ITS CONSERVATION:**
Introduction, Definition, genetic, species and ecosystem diversity, Bio-geographical classification of India, India as a Mega-Diversity Nation, Hot spots of biodiversity, Value of

biodiversity, threats to biodiversity, endemic, endangered and extinct species of India, In-Situ and Ex-situ conservation of biodiversity.

**UNIT-IV**
**ENVIRONMENTAL POLLUTION AND GLOBAL ENVIRONMENTAL ISSUES:**
Natural Disasters: Droughts, Floods, Cyclone, Landslides, Earthquake,
Pollution episodes: Air pollution, Water pollution, Land pollution, Noise pollution, Automobile pollution and Nuclear pollution –Effects-Global warming, Acid Rain and Ozone layer depletion and controlling measures.
Global Environmental Issues: Population Growth, Urbanizations, Land Management, Water and Waste Water Management. Climate change and impacts on human environment
Solid Waste Management: causes, effects and control measures of Municipal solid wastes – E-waste and management, Role of an individual in prevention of pollution – pollution case studies.

**UNIT-V**
**ENVIRONMENTAL LEGISLATION, LAWS, POLICIES FOR SUSTAINABLE DEVELOPMENT:**
Environmental Legislation, Environmental Protection act – Air Prevention and Control of Pollution act–Water Prevention and control of Pollution act– Wildlife protection act – Forest conservation act – Municipal Solid Waste management, International conventions/Protocols: Earth summit, Kyoto protocol and Montreal Protocol. From Unsustainable to sustainable development, Role of NGO's for Sustainable development, Concepts of Green belt development, Role of IT in Environment-Remote Sensing and GIS methods for Sustainable development.

**Field work**- visit to a local area to document environmental assets-river forest grassland/hill, mountain and polluted sites (urban/rural/industrial/Agriculture) - study simple ecosystems (pond/river/hill slopes)

**TEXT BOOKS:**
1. *A Text book on Environmental Sciences* by Kaushik A and Kaushik C P 5th edition, New age international publishers, 2015.
2. *Text Book of Environmental Science and Technology* by Anji Reddy M, BS Publications, 2007.

**REFERENCES:**
1. *Environmental Studies,* Anil Kumar and Arnab Kumar De, New Age International Publishers, New Delhi, 3rd Edition 2015.
2. *Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards*, R.K. Trivedi, Vol.I and II, Enviro Media.
3. *Environmental Studies* by Mukkanthi K, S. Chand Publishers, 2010.
4. *Environmental Studies-From Crisis to Cure*, Rajagopalan.R Oxford University Press, 2005.
5. *Text Book of Environmental Studies*, Erach Bharucha, University Grants Commission, University Press (India) Pvt. Ltd., Hyderabad,2010.

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### (16CE110) BUILDING PLANNING & DRAWING

**Course Educational Objectives:**
- This subject provides the knowledge of building by laws, registration, planning of various types of buildings
- This subject also provides drawing of different sign convention of various Civil Engineering Materials, Doors, windows, tiles of roof, building plans etc.

**Course Outcomes:**
Students undergoing this course are able to
- understand Building Byelaws
- planning a residential & public building
- plot the drawing for approval

### PART-A

**UNIT -I**
**PLANING OF BUILDINGS**: Types of buildings: types of residential buildings - Site selection for residential building - Orientation of buildings: aspect; prospect; privacy - Furniture requirement: grouping; circulation, sanitation, lighting, ventilation, cleanliness, flexibility, elegancy, economy, practical considerations.
**BUILDING BYELAWS AND REGULATIONS**: Introduction – Terminology - Objectives of building byelaws - Minimum plot sizes - Open space requirements - Plinth area, floor area, carpet area - Floor area ratio (FAR), Floor space Index (FSI) - Areas for different units - Principles underlying building byelaws - Built up area limitations – Height of buildings - Wall thickness - Lighting and ventilation requirement - Safety from fire - Drainage and sanitation -  Applicability of the bye-laws.

**UNIT –II**
**PLANNING OF RESIDENTIAL BUILDINGS:**  Minimum standards for various parts of buildings – Requirements of different rooms and their grouping – Characteristics of various types of residential buildings
**PLANNING OF PUBLIC BUILDING:** Planning: educational institutions, hospitals, office buildings, banks, industrial buildings, hotels and hotels, hostels, bus station.

**UNIT -III**
**BUILDINGS: SAFETY AND COMFORT**: Aspects of safety- Structural, health, fire and constructional safety - Components of building automation system - HVAC, electrical lighting, Security - Fire-fighting, Communication etc.- Design for thermal comfort - Ventilation comfort -  Air conditioning comfort - Lighting comfort - Noise and acoustic comfort.

## PART-B

**UNIT -IV**

**SIGN CONVENTIONS AND BONDS:** Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin, and white lead etc., earth, rock, timber and marble, English bond & Flemish bond, odd & even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

**DOORS WINDOWS, VENTILATORS AND ROOFS:** Paneled door– Paneled and glazed door Glazed windows – Paneled windows - Swing ventilator – Fixed ventilator; Couple roof – Collar roof - Kind post truss – Queen post truss.

**UNIT –V**

Given line diagram with specification to draw plan, section and elevation of:
1. Residential Building
2. Hospital
3. Schools
4. Post office

**FINAL EXAMINATION PATTERN:** The end examination paper should consist of Part- A and Part-B. Part- A consists of three questions with either or choice from three units in planning portion. Each question carries 10 marks. Total marks for Part-A is 30 marks. Part- B consists of two questions with either or choice from drawing portion. Question from unit-IV carries 5 marks and question from Unit-V carries 20 marks. Total marks for Part-B is 25 marks.

**TEXT BOOKS:**
1. *Building Planning, Designing and Scheduling,*Gurcharan Singh, Standard Publisher Distributors
2. *Building Planning and Design,*8th Revised Edition, N. Kumaraswamy and A. Kameswara Rao, Charotar Publishing House Pvt. Ltd.

**REFERENCES:**
1. *Building by Laws* by State and Central Governments and Municipal Corporations.
2. National Building Code.
3. *Building Drawing with an Integrated Approach to Built Environment*, 4th Edition*, M. Shah, C. Kale, S. Patki, Tata McGraw Hill Education*.

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## (16CE111) STRENGTH OF MATERIALS – II

**Course Objectives:**
- To understand the basic concepts of principal stresses and strains and their failures.
- To understand the applications of thin cylinders and thick cylinders and to learn the applications of torsion of circular shafts and springs.
- To understand the behaviour of different types of beams.
- To understand the theories of Failures and unsymmetrical bending of beams.

**Course Outcomes:**
On completion of the course, the students will be able to:
- determine different stresses developed in thin and thick cylinders.
- visualize the behaviour of column for combined bending and axial loading.
- determine the behaviour of unsymmetrical bending in members.

## 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 Lame's theory for thick cylinders – Derivation of lame'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
**DIRECT AND BENDING STRESS:** 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 axes.

**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**
**UNSYMETRICAL 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. *Strength of Materials (Mechanics of Solids)*, 6th Edition, Er. R.K. Rajput, S. Chand Publishing
2. *A Textbook of Strength of Materials*, 6th Edition, Dr. R. K. Bansal, Laxmi Publications

**REFERENCES:**
1. *Mechanics of Materials*, Revised, 2016 Edition, Dr. B. C. Punmia, Er. Ashok Kr. Jain, Dr. Arun Kumar Jain, Laxmi Publications
2. *Strength of Materials*, 3rd Edition, R. Subramanian, Oxford University Press
3. *Strength of Materials*, 24th Edition, R. S. Khurmi, S. Chand Publishing
4. *Strength of Materials*, 11th Edition, Sadhu Singh, Khanna Publishers

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**(16CE113) HYDRAULICS & HYDRAULIC MACHINERY**

**Course Objectives:**
- To relate the theory and practice of problems in hydraulic engineering
- To learn the behavior of types of flows, types of channels
- To learn the different hydraulic models
- To learn the basics of turbo machinery, hydraulic turbines and performance of turbines

**Course Outcomes:**
- analyze fluid flows in open channel hydraulics and devices such as weirs and flumes.
- design open channels for most economical sections like rectangular, trapezoidal and circular sections
- measure velocity through instruments in open channel and pipe flow
- select the type of turbine required with reference to available head of water and discharge

**UNIT-I**
**OPEN CHANNEL FLOW**
**UNIFORM FLOW:** Introduction - Differences between pipe flow and open channel flow - Classification of flows - Types of channels - Flow analysis: The Chezy's equation, Empirical formulae for the Chezy's constant - Hydraulically efficient channel sections.
**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 - Specific force - Specific force curve.

**UNIT-II**
**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 step method.

**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.

**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 into dynamic machines.

**UNIT-IV**
**HYDRAULIC TURBINES-I:** Introduction - Layout of Hydro-electric power plant - Types of hydro power plants - Head and efficiencies of hydraulic turbines -Classification of turbines - Pelton wheel: parts - Velocity triangles, work done and efficiency - Design of Pelton wheel - Radial flow reaction turbines -Francis turbine: main components and working -Work done and efficiencies - Design proportions - Design of Francis turbine runner.
**HYDRAULIC TURBINES-II:** Kaplan turbine: main components and working - Working proportions - Draft tube: theory and efficiency - Specific speed -Cavitation: causes, effects - Unit quantities and performance of characteristic curves of a turbine.

**UNIT-V**
**HYDRAULIC 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, Cavitation effects, Multistage centrifugal pumps, troubles and remedies-Reciprocating pumps.
**DIMENSIONAL ANALYSIS AND SIMILITUDE:** Introduction – Dimensions: dimensional homogeneity - Methods of dimensional analysis- Rayleigh's method - Buckingham - Pi theorem. Similitude - Types of Similarities. Model Laws.

**TEXT BOOKS:**
1. *Flow in Open Channels*, 3rd Edition, K Subramanya, Tata McGraw-Hill Publishing Company Limited.
2. *Hydraulics and Fluid Mechanics Including Hydraulics Machines (A-4-Size)*, 20th Edition, Dr. P.N. Modi & Dr. S.M. Seth, Standard Book House
3. *A Textbook of Fluid Mechanics and Hydraulic Machines,* 9th Edition, Dr. R. K. Bansal, Laxmi Publications

**REFERENCES:**
1. *Fluid Mechanics*, 9th Edition, Victor Streeter, E. Benjamin Wylie, K.W. Bedford, McGraw Hill Education
2. *Fluid Mechanics and Machinery*, 1st Edition, C.S.P.Ojha, P.N. Chandamouli & R. Berndtsson, Oxford University Press
3. *Fluid Mechanics and Hydraulic Machines*, 1st Edition, S. C. Gupta, Pearson India Education Services Pvt. Ltd.
4. *Fluid Mechanics and Machinery*, 1st Edition, Rama Durgaiah D., New Age International

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### (16CE114) SURVEYING LAB-II

**Course Objectives:**
- To introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works
- To set out simple curves for high ways and railways and to determine height of remote objective, horizontal distance and coordinates of points using total station

**Course Outcomes:**
Students undergoing this course are able to
- gains in accurate measurement of horizontal and vertical angles by theodolite and total station
- attains skills in computing the horizontal as well as vertical distance using tangential tachometry and expertise in handling of dumpy level, theodolite and total station for developing contour maps and longer sighting of objective distance and difference in elevation

**LIST OF EXPERIMENTS:**
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. Determination of height of building by trigonometric survey
4. Determination of height of hill by trigonometric survey
5. Heights and distance using Principles of tachometric surveying
6. Curve setting by offsets from long chord.
7. Curve setting by deflection angle method
8. Curve setting by two theodolite method.
9. Setting out works for buildings & pipe lines.
10. Determination of area using total station.
11. Traversing using total station.
12. Contouring using total station.
13. Determination of remote height using total station.
14. Distance, gradient, Diff. height between tow inaccessible points using total stations.

**LIST OF EQUIPMENT:**
1. The odolite and leveling staffs.
2. Tachometers.
3. Total station.

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### (16CE115) COMPUTER AIDED DRAWING LAB

## Course Objectives:
- A Student will able to know how to apply engineering drawing using computers.
- A student can understand about the scope of Auto CAD software.
- A student will know what is plan and how it should draw in Auto CAD software.
- To learn about applications and advantages of Auto CAD.
- To learn about the basic commands of Auto CAD.

### Course Outcomes:
- The students will be able to draft the plan, elevation and sectional views of the buildings, industrial structures, and framed buildings using computer software's.
- Draw the symbols and plan of a residential building using Auto CAD Software.

## COURSE CONTENT:
**1.0    Introduction to Computer Aided Drafting (CAD):**
    1.1    About Auto CAD.
    1.2    Computer graphics.
    1.3    Definition of CAD.
    1.4    Applications of CAD.
    1.5    Advantages of CAD
    1.6    Introduction to Auto CAD as drafting package.
    1.7    Hardware requirements.
**2.0    Practice on Auto CAD:**
    2.1    Graphical User Interface.
    2.2    Study of drawing editor screen.
    2.3    List out methods to access Auto CAD commands.
    2.4    Practice of setting up of drawing area using utility commands & using setting commands.
    2.5    Practice of File Management New, Open, Save, Save As, Export, Print, Publish, Drawing utilities, Units.
    2.6    Practice of Geometrical commands line, Polyline, Circle, Erase, Oops, Snap, Arc, Ellipse, Polygon, Spline, Ellipse, Rectangle, and Donut.
    2.7    Draw the given geometrical figures using draw commands
    2.8    Practice of Modify Commands Move, Copy, Array, Break, Mirror, Offset, Scale, Rotate, Trim, Extend, Stretch, Solid,  Fillet, Chamfer, Explode.
    2.9    Draw the given figures using draw & Modifying commands.
    2.10   Practice of Object Properties Color, Line type, Line weight.
    2.11   Practice of view commands Zoom, Pan.
    2.12   Practice of Drafting Settings.
    2.13   Practice of Hatch, Gradient commands.
    2.14   Practice of Block &insert commands.

**3.0    Annotations:**
   3.1    Practice of Text, Text Justifications, Multi Line text, Text style, Scale text, Spell.
   3.2    Practice on Leader, Multi Leader and Leader settings.
   3.3    Practices on Table.
   3.3    Practice On Dimensioning, DimLinear, Dimradius, DimAligned, DimDiameter, Dimcenter, Dim Angular, DimBaseline, Dimcontinue, Dimordinate, Dimensional settings.
   3.4    Utilities, Distance, Radius, Angle, Area, volume.
   3.5    Layer properties, make object Layer current, Match, previous, Isolate and Un-Isolate, Freeze, Off, turn all layers on, thaw all layers, Lock, Unlock, Change to current Layer, Copy objects to new Layer, Layer Walk, Isolate to current View port, Merge, Delete, Locked Layer fading.
   3.6    Practice Plans using Layers.

**4.0    Geometric constructions:**
   4.1    Practice on Point, DDP type, Divide, Measure.
   4.2    Divide a given line into desired number of equal parts internally.
   4.3    Draw tangent lines and arcs.
   4.4    Construct a hexagon from the given data.
   4.5    Construct ellipse, parabola, hyperbola, cycloid and helix.
   4.6    Using CAD software draws & prints the following drawings.
   4.7    Draw conventional signs as per I.S. Standards, Symbols used in civil engineering drawing.
   4.8    Draw the important joinery components of the building like elevation of fully paneled double leaf door, elevation of partly glazed and partly paneled window.

**5.0     Residential building:**
   5.1     Plan, Elevation, Section of single roomed building.
   5.2     Single storied bearing type residential building,
         5.2.1 One Bed Room House.
         5.2.2 Two Bed Room House.
   5.3     Single storied framed structure type residential building,
         5.3.1 One Bed Room House.
         5.3.2 Two Bed Room House.
   5.4     Drawing to be submitted for approval to corporate or municipality showing required details in one sheet such as,
         5.4.1 Plan-Showing Dimensions of all rooms.
         5.4.2 Section-Showing specifications and Typical Foundation Details.
         5.4.3 Elevation.
         5.4.4 Site Plan- Showing Boundaries of site and plinth Area, car parking, passages and location of septic tank.
         5.4.5 Key plan- Showing the location of building.
         5.4.6 Title block- Showing Signature of owner & Licensed surveyor's.

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### (16CE118) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

**Course Objectives:**
- To learn the concepts of Venturimeter & Orifice meter
- To learn the concepts of notch's
- To learn the basic concepts of turbines
- To learn the basics concepts of different types of pumps.

**Course Outcomes:**
Students undergoing this course are able to
- Calibrate Venturimeter & Orifice meter
- Calculate losses in flows
- Estimate the efficiency of different pumps.
- Study the performance of different turbines.

## LIST OF EXPERIMENTS:
**\*Cycle 1:**
1. Verification of Bernoulli's equation.
2. Calibration of Coefficient of discharge for Venturimeter.
3. Calibration of Coefficient of discharge for Orifice meter.
4. Calibration of Friction factor. (major losses experiment)
5. Determination of loss of head due to sudden contraction. (minor losses experiment)
6. Calibration of Discharge over Notches (Rectangular/Triangular Notch.)
7. Determination of Coefficient of discharge for a small orifice / mouthpiece by a constant head method / variable head method.

**\*Cycle 2:**
8. Impact of jet on vanes.
9. Performance test on Pelton wheel turbine.
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Study on Hydraulic jump.
13. Performance test on Kaplan turbine

**\*Minimum Four experiments** must be conducted in the lab from each cycle

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**(COE-II) COMPREHENSIVE ONLINE EXAMINATION -II**

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### (16HS614) COMPREHENSIVE SOFT-SKILLS
### (AUDIT COURSE)
### (Common to All Branches)

**Course Description:**
Soft Skills is an intangible idea in which the qualities like attitude, ability, integrity, reliability, positivity, flexibility, dependability, punctuality, management, cooperation, habits and practices are combined proficiently to capitalize on a person's work efficacy. Soft Skills do the work of combining all these components in accurate share into skills and shaping them into competencies. Companies opt for, maintain and prop up persons, who are trustworthy, ingenious, principled and good communicators and who are prepared to work under stress. These lessons are developed with a view to create awareness of the importance of the soft skills and assist the learners to improve them.

**Course Objectives:**
The main objectives of this course are:
- To help the students understand interpersonal skills.
- To support them in building interpersonal skills.
- To enhance the ability to work with others.

**Course Outcomes:**
- To know the importance of Soft Skills.
- To apply Soft Skills in the different environment.
- To enrich the different levels of Soft Skills to develop their personality.

**UNIT I**
Non verbal Communication – Body Cues – Smiling, Posture, Gesture, Eye-contact – Stage appearance – Interpersonal and Intrapersonal skill Telephonic Etiquette – Dos and Don'ts of Telephonic Conversation

**UNIT II**
Self exploration – Self Discovery – Self acceptance – Self esteem – Self confidence – Personal grooming – Attitudes – Confidence building. Interpersonal relationship in the present context – Kinds of relationships – Team building – Formation of team

**UNIT III**
Vision and Goal setting – Personal goal – Career goal – Types of Organization – Deep dive of company profiles – Win-win situation – Proactive skills – Entrepreneurial skills and model start-ups- Developing Mind skills – quizzes – General knowledge – Puzzles – Reading Comprehension - Spell Bee - Seminar – Who is who? – Biographies

**UNIT IV**
Flight Leadership: Assessing Leadership qualities – Experiential learning of leadership skills exercise in team work Time and Stress Management: Importance of Time Management – The

art of prioritizing and scheduling – Stress and Source of Stress  Types of Stress – Managing stress

**UNIT V**
Change: Coping skills – Critical and Adaptive Mindsets – Changes in Career/ Life/ people – Just A Minute – Mock GDs and Mock Interviews

**REFERENCES:**
1. *Business Communication*, Aruna Koneru
2. *Effective Tech Communication*, Rizvi, Tata McGraw – Hill Education, 2007.
3. *Reading Extra*, Liz Driscoll, Cambridge University Press, 2004.
4. *Speak Well*, Jayashree Mohanraj et al, Orient Blackswan, 2013.

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**(16CE117) Structural Analysis – I**

*Course Objectives:*
*   *To learn application of Castiglione's theorems 1& 2 for beams and trusses.*
*   *To learn and analyze fixed beam*
*   *To learn and analyze continuous beams by Clapeyron's theorem of three moments*
*   *To learn and analyze continuous beams and frames by slope deflection method, Moment distribution and Kani's method.*

*Course Outcomes:*
*On completion of the course, the students will be able to:*
*   *Understand the application of Castiglione's theorem.*
*   *Analyse continuous beams and portal frames by slope deflection method.*
*   *Analyse continuous beams and portal frames by moment distribution method.*
*   *Analyse continuous beams and portal frames by Kani's method*

**UNIT - I**
**ENERGY METHODS:** Strain Energy Due to Axial Load, Bending Moment and Shear Forces - Maxwell's, Betti's theorems - Castigliano's First Theorem and Unit Load Method - Deflection of Simple Beams and Pin-Jointed Trusses.
**INDETERMINATE STRUCTURAL ANALYSIS:** Indeterminate Structural Analysis - Determination of Static and Kinematic Indeterminacies - Solution of Trusses having up to Two Degrees of Internal and External Indeterminacies - Castigliano's Theorem – II – Lack of Fit.

**UNIT - II**
**ANALYSIS OF FIXED BEAMS:** Fixed Beams with UDL, Point Loads, Uniformly Varying Load, Couple - Shear Force and Bending Moment Diagrams - Deflections - Effect of Sinking of Support.
**ANALYSIS OF CONTINUOUS BEAMS:** Clapeyron's Theorem of Three Moments – Derivation of Theorem – Application to Continuous Beams with Point Load, Eccentric Load, Uniformly Distributed Load and Couple – Sinking of Supports – Shear Force and Bending Moment Diagrams.

**UNIT - III**
**SLOPE DEFLECTION METHOD:** Slope Deflection Equation - Application to Continuous Beams with Degree of Indeterminacy Not Exceeding Three, Effect of Sinking. - Analysis of Single Bay and Single Storey Portal Frames with and without Sway.

**UNIT - IV**
**MOMENT DISTRIBUTION METHOD:** Stiffness and Carry Over Factors - Distribution Factors – Analysis of Continuous Beams Degree of Indeterminacy Not Exceeding Three, Effect of Sinking - Analysis of Single Bay and Single Storey Portal Frames with and without Sway

**UNIT - V**
**KANI'S METHOD:** Introduction - Application to Continuous Beams, Settlement of Supports, Single Bay Portal Frames with Side Sway.

**TEXT BOOKS:**
1. *Structural Analysis – Vol. 1 & Vol. 2* by Bhavikatti, S.S, Vikas Publishing Pvt Ltd., New Delhi, 2008
2. *Comprehensive Structural Analysis – Vol. 1 & Vol. 2* by Vaidyanadhan, R and Perumal, P, Laxmi Publications, Pvt. Ltd, New Delhi, 2003

**REFERENCES:**
1. *Theory of structures* by Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications Pvt. Ltd., New Delhi, 2004
2. *Theory of structures* by Ramamuratam, Jain book depot, New Delhi.
3. *Analysis of structures* by Vazrani & Ratwani, Khanna Publications.

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### (16CE118) Concrete Technology

*Course Objective:*

- *Concrete structures and concrete as a construction material is quite popular in developing countries like India. Also, the part of world where steel, wood and other construction materials are widely in use;*
- *Concrete got a significant presence, especially the advances made to it. Therefore, understanding properties, construction practices associated with concrete is the need of the hour.*
- *The subject gives basic and essential knowledge to graduate students about concrete, its ingredients and mix design.*

*Course Outcome:*

- *Can understand properties of concrete and its various ingredients*
- *Can be able to perform test on cement, fine aggregate, coarse aggregate and concrete*
- *Can understand quality related issues with concrete and measures to overcome poor quality concrete during construction*
- *Able to access the strength of concrete with the help of non-destructive testing*
- *Able to design the concrete mix*

**UNIT - I**
**CEMENTS & ADMIXTURES:** Portland Cement – Chemical Composition – Hydration, Setting of Cement – Structure of Hydrated Cement – Tests on Physical Properties – Different Grades of Cement – Admixtures – Mineral and Chemical Admixtures.
**AGGREGATES:** Classification of Aggregate - Physical, Strength & Other Mechanical Properties of Aggregate – Specific Gravity, Bulk Density, Porosity, Adsorption & Moisture Content of Aggregate – Soundness of Aggregate– Deleterious Substance in Aggregate - Alkali Aggregate Reaction – Thermal Properties – Sieve Analysis – Fineness Modulus – Grading Curves – Grading of Fine & Coarse Aggregates – Gap Graded Aggregate - Bulking of Sand

**UNIT - II**
**FRESH CONCRETE:** Workability – Factors Affecting Workability – Measurement of Workability by Different Tests – Setting Times of Concrete - Segregation & Bleeding – Mixing and Vibration of Concrete – Steps in Manufacture of Concrete – Quality of Mixing Water.
**HARDENED CONCRETE:** Water / Cement Ratio – Abram's Law – Gel Space Ratio – Strength of Concrete – Maturity Concept – Strength in Tension & Compression – Compression Tests – Tension Tests –– Flexure Tests – Splitting Tests – Relation Between Compressive & Tensile Strength - Factors Affecting Strength - Curing.
**UNIT - III**
**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.
**NON-DESTRUCTIVE TESTING METHODS:** Introduction to Non-Destructive Testing Methods – Rebound Hammer – Ultra Pulse Velocity Method – Pullout - Profometer - Codal Provisions for NDT.

**UNIT - IV**
**MIX DESIGN:** Durability of Concrete – Quality Control of Concrete – Factors Considered for Mix Proportions – Statistical Methods of Mix Design – Acceptance Criteria – Proportioning of Concrete Mixes by Various Methods – ACI Method & IS 10262 Method

**UNIT - V**
**SPECIAL CONCRETES:** Light Weight Concrete – Light Weight Aggregate Concrete – Cellular Concrete – No Fines Concrete – High Density Concrete – Fiber Reinforced Concrete – Different Types of Fibers – Factors Affecting Properties of F.R.C – High Performance Concrete – Self Compacting Concrete – Self Healing Concretes.

**TEXT BOOKS:**
1. *Concrete Technology* by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. *Concrete Technology* by M.S. Shetty. – S. Chand& Co.; 2004

**REFERENCES:**
1. *Properties of Concrete* by A.M. Neville – Pearson publication – 4th edition
2. *Concrete: Micro structure, Properties and Materials* by P.K. Mehta and J.M. Monteiro, Mc-Graw Hill Publishers
3. *Design of Concrete Mix* by Krishna Raju, CBS publishers.
4. *Non-Destructive Test and Evaluation of materials* by J. Prasad& C.G.K. Nair, McGraw hill Publishers, New Delhi.
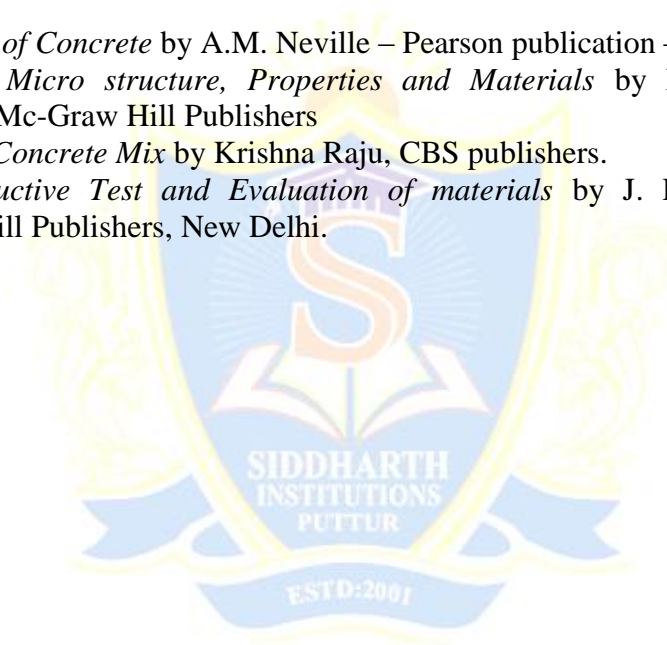
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**(16CE119) Design & Drawing of Reinforced Concrete Structures**

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

*Course Outcomes:*
*After completing the course, the student*
- *Can get an over view of Working Stress Method*
- *Can understand the concept of Limit State Design*
- *Can under the IS 456-2000 codal provisions for designing & detailing*
- *Can design the beams, slabs, stair case, columns & footing for Limit State of Collapse and Limit State of Serviceability*

**UNIT - I**
**INTRODUCTION:** Concepts of Reinforced Concrete Design –Introduction to Working Stress Method - Limit State Method – Material – Stress Vs Strain Curves for Concrete & Steel – Safety Factors – Characteristic Values - Stress Block Parameters – IS: 456 –2000.
**BEAMS:** Limit State Analysis & Design of Singly Reinforced, Doubly Reinforced and Flanged Sections.

**UNIT - II**
**DESIGN FOR SHEAR, TORSION & BOND:** Limit State Analysis and Design of Section for Shear and Torsion – Concept of Bond, Anchorage and Development Length - IS 456 – 2000 Code Provisions - Design Examples in Simply Supported and Continuous Beams - Detailing
**LIMIT STATE OF SERVICEABILITY:** Limit State Design for Serviceability in Case of Deflection, Cracking and Codal Provision.

**UNIT - III**
Design of One-Way, Two-way & Cantilever Slabs Using IS 456 – 2000

**UNIT - IV**
Types of Columns – Design of Columns for Axial Load, Uni Axial and Biaxial Using IS 456 – 2000 & SP16

**UNIT - V**
Design of Footings - Isolated (Square, Rectangular)
Design of Stair-Case – Dog Legged & 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

**Examination patron:**

**Mid Exam:** The mid examination paper should consist of Part A and Part B. Part A consists of *Two* questions in Design and Drawing out of which one question is to be answered. Part B should consist of *Three* questions on design out of which *Two* are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

**End Exam:** The end examination paper should consist of Part A and Part B. Part A consists 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. *Limit State Design* by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. *Reinforced concrete design* by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi

**REFERENCES:**
1. *Limit State Design* by A. K. Jain, New Chand & Brothers, 7th edition.
2. *Analysis of skeletal structures* by seetharamulu kaveti, TMH publications.
3. *Reinforced concrete* design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.
4. *Fundamentals of reinforced concrete* by N.C. Sinha and S.K Roy, S. Chand publishers

**Codes/Tables:** IS 456-2000 and SP16 code books to be permitted in the examination.
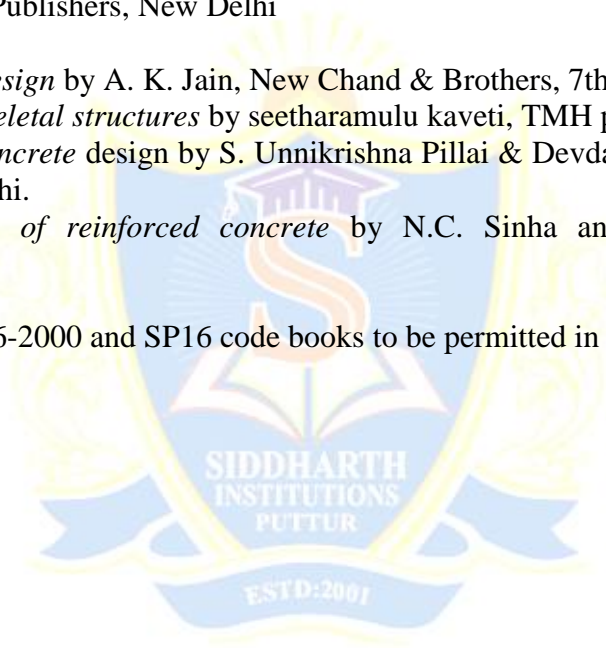
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**(16CE120) Water Resources Engineering - I**

**Course Objectives:**

*To study the concepts of*

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

**Course Outcomes:**

*After completing the course, the student*

- *Can understand surface hydrology*
- *Can understand ground water hydrology*
- *Can estimate crop water requirements*
- *Can learn & design about various irrigation structures*

**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.

**UNIT - II**

**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

**HYDROGRAPH ANALYSIS**: Hydrograph: Unit Hydrograph - Construction and Limitations of Unit Hydrograph - Application of Unit Hydrograph - S-Hydrograph.

**UNIT - III**

**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 - IV**
**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 V**
**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

**TEXT BOOKS:**
1. *Irrigation Water Resources and Power Engineering*, by Dr. P.N. Modi, 9th Edition, Standard Book House.
2. *Engineering Hydrology* by K Subramanya, 4th Edition, McGraw Hill Publication.

**REFERENCES:**
1. *Water Resource Engineering Vol.I& Vol. II* by Santhosh Kumar Garg, 23rd Edition, Khanna Publishers
2. *A Textbook of Hydrology* by Dr. P. Jaya Rami Reddy, 3rd Edition: Publisher: Laxmi Publications
3. *Irrigation and Water Power Engineering* by Dr. B.C. Punmia, Dr. Pande BrijBasi Lal, Ashok Kumar Jain, Dr. Arun Kumar Jain, 16thEdition, Laxmi Publications.

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### (16CE121) Engineering Geology

*Course Objectives:*
- *The objective of this 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. Geological hazards and gives a suitable picture on the geological aspects that are to be considered for the planning and construction of major civil engineering projects.*

*Course Outcomes:*
- *This course helps to know the identification of rocks, minerals, engineering geology problems and also basics of earth science.*

**UNIT - I**
**INTRODUCTION:**
Introduction to Geology And its Various Branches - Role of Earth Sciences in Civil Engineering Operations - Processes Acting at the Surface of The Earth - Volcanism, Geological Action of Wind, Glaciers, Rivers and Oceans - Rock Weathering- Weathering of Common Rock like "Granite".

**UNIT - II**
**MINERALOGY:** Study of Various Properties for the Identification of Minerals - Different Methods of Study of Minerals - Advantages of Study of Minerals by Physical Properties - Study of Minerals like Quartz and its Varieties - Feldspar, Garnet, Mica, Olivine, Hornblende, Augite, Calcite, Talc, Kyanite, Bauxite and Clay Minerals**.**

**UNIT - III**
**PETROLOGY:** Origin and Formation of Rocks - Classification of Rocks - Igneous, Sedimentary and Metamorphic rocks - Their Textures and Structures - Study of Rocks like Granite, Gabbro, Dolerite, Basalt, Breccia, Conglomerate, Sand Stone, Shale, Limestone, Laterite, Quartzite, Schist, Gneiss, Marble, Slate.

**UNIT - IV**
**STRUCTURAL GEOLOGY:** Elements of Structural Geology like Strike, Dip, Outcrop - Study of Folds, Joints, Faults, Unconformities and Their Importance in Civil Engineering Works.
**GROUND WATER, EARTH QUAKE & LAND SLIDES:** Ground Water, Water Table, Common Types of Ground Water, Ground Water Exploration - Earth Quakes - Causes and Effects of Earth Quakes - Seismic Waves, Richter Scale, Precautions to be Taken for Building Construction in Seismic Areas – Landslides - Their Causes and Effect - Measures to be Taken to Prevent Their Occurrence.

**UNIT - V**
**GEOLOGY OF DAMS, RESERVOIRS AND TUNNELS:** Geology of Dams - Geological Considerations in the Selection of a Dam Site – Reservoirs - Tunnels Purposes of Tunneling - Effects of Tunneling on the Ground - Role of Geological Considerationsin Tunneling Over Break and Lining in Tunnels.

**TEXT BOOKS:**
1. *Engineering Geology* by N. Chennkesavulu, Mc-Millan, India Ltd.
2. *Engineering geology* by vasudev kanthi, Universities press, Hyderabad.
3. *Engineering Geology* by D.Venkata Reddy, Vikas Publications, New Delhi.

**REFERENCES:**
1. *Engineering geology* by Prabin singh, Katson Publications
2. *Engineering Geology* by Subinoy Gangopadhyay, Oxford University press.
3. *Principals of Engineering Geology* by K.V.G.K. Gokhale – B.S publications
4. *Fundamental of Engineering Geology* Butter worths by F.G. Bell, Publications, New Delhi.

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**(16CE122) Geotechnical Engineering - I**

*Course Objectives:*
- *To provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures to identify factors controlling soil behavior and methods to determine soil properties.*
- *Students will acquire basic knowledge in engineering properties of soil that helps in designing geotechnical systems*

*Course Outcomes:*
*Students who successfully complete this course will be able to:*
- *Understand the origin of the soil and geological cycle.*
- *Understand and use IS method for soil classification.*
- *Understand the basic science of soil compaction.*
- *Understand basics principles of flow and soil permeability through porous media*
- *Understand seepage in soil include Laplace equation of continuity*

**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 – IS 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 Wester Gaard'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 Vs P and e Vs log(P) Curves – Normally Consolidated Soil, Over Consolidated Soil and Under Consolidated Soil – Pre-Consolidation Pressure and Its Determination – Terzagh's One-Dimensional 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 Envelops – Shear Strength of Sands – Dilatancy – Critical Void Ratio – Liquefaction- Shear Strength of Clays.

**TEXT BOOKS:**
1. *Geotechnical Engineering* by C. Venkataramiah, New age International Pvt. Ltd,
2. *Geotechnical Engineering* by V.N.S. Murthy, CRC Press, New York, Special Indian Edition

**REFERENCES:**
1. *Geotechnical Engineering* by Brije. M. Das, Cengage Publications, New Delhi
2. *Basic and Applied Soil Mechanics* by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi.
3. *Soil Mechanics and Foundation Engg.* by K.R. Arora, Standard Publishers
4. *Soil Mechanics and Foundation* by B.C. Punmia, Ashok Kumar Jain and Arum Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

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**(16CE123) Concrete Technology Lab**

*Course Objectives:*
- *The purpose of this lab is to train student on various experiments related to accessing properties and quality of concrete, cement and sand.*

*Course Outcomes:*
- *After completion of this lab the student in position to access the quality of cement by conducting following tests:*
  - *Normal consistency, Initial Setting & Final Setting of Cement*
  - *Fineness of Cement & Specific Gravity of Cement*
  - *Soundness of Cement*
  - *Compressive Strength of Cement*
- *Also the student can conduct following tests on concrete related to Compressive Strength and Workability:*
  - *Slump Cone, Vee – Bee & Compaction Factor for Workability of Concrete*
  - *Compressive Strength of Concrete*
- *Apart from this student can determine the specific gravity and water absorption on fine aggregate and bulking of fine aggregate.*
- *Some non-destructive test procedures are also demonstrated to student*

**LIST OF EXPERIMENTS**

   **I. CEMENT:**
1. Normal Consistency, Initial Setting Time and Final Setting Time of Cement
2. Soundness of Cement and Fineness of Cement
3. Specific Gravity of Cement
4. Compressive Strength of Cement

   **II. FINE AGGREGATE:**
1. Fineness modulus of Fine Aggregate
2. Specific Gravity and Water Absorption of Fine Aggregate
3. Moisture Content and Bulking of Fine Aggregate

   **III. CONCRETE:**
1. Workability Test on Concrete by Slump, Compaction Factor and Vee-Bee
2. Compressive Strength and Young's Modulus of Concrete
3. Non-Destructive Testing on Concrete (For Demonstration)

**REFERENCES:**
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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**(16CE124) Engineering Geology Lab**

*Course Objectives:*

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

*Course Outcomes:*

*After completion of this lab the student:*

- *Can conduct macroscopic tests on rack forming minerals to identify*
- *Can conduct macroscopic tests on rocks to identify*
- *Can be in position to interpret geological models*
- *Can perform strike and dip 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 of a Geological Section
4. Simple Strike and Dip Problems

**TEXT BOOKS:**

1. *Elementary Exercises in Geology* by CVRK Prasad, Universities press.
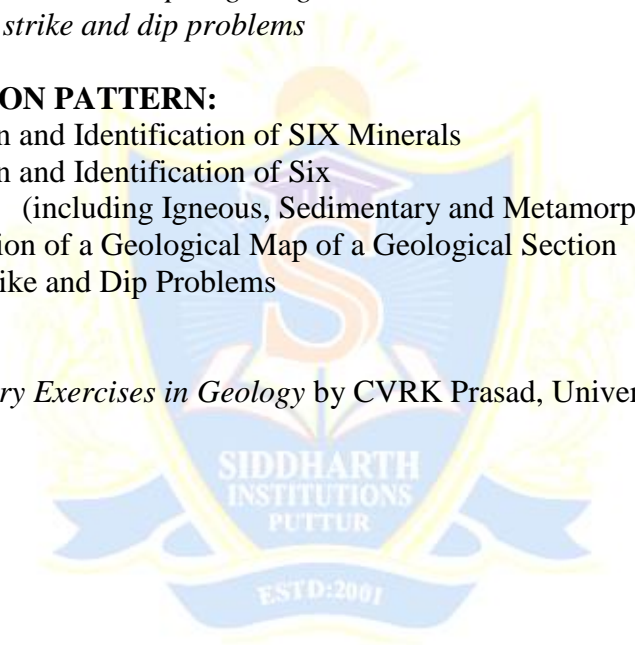
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**(16CE125) Structural Analysis - II**

*Course Objectives:*

- *To have basic knowledge of three and two hinged arches under static loads*
- *To learn and analyze of frames by approximate methods.*
- *To have basic knowledge of maximum shear force and bending moment due to moving loads.*
- *To learn and analyze continuous beams by flexibility methodand stiffness methods.*
- *To have basic knowledge of plastic analysis and analyze continuous beams and portal frames.*

*Course Outcomes:*

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

- *Analyze the arches with different end conditions*
- *Analyze the frames by approximate method of analysis*
- *Analyze the effects of moving loads on simply supported beams.*
- *Solve statically indeterminate structures using matrix (Stiffness & flexibility) methods.*
- *find the collapse loads of different structural frames*

**UNIT - I**
**ARCHES:** Arches as Structural Forms – Types of Arches – Determination of Horizontal Thrust, Bending Moment, Normal Thrust and Radial Shear - Analysis of Three Hinged, Two Hinged and Fixed Arches, Parabolic and Circular Arches – Settlement and Temperature Effects.

**UNIT - II**
**APPROXIMATE METHODS OF ANALYSIS OF FRAMES:** Substitute Frame Method for Vertical Loads – Portal and Cantilever Methods for Horizontal Loads

**UNIT - III**
**INFLUENCE LINES AND MOVING LOADS:** Influence Lines for Reactions, BM and SF; Curves of Maximum BM and SF for Single, Two and Multipoint Loads, UDL Longer and Shorter than Span, Enveloping Parabolic and EUDL – Forces in Truss Members

**UNIT - IV**
**INTRODUCTION TO MATRIX METHODS OF STRUCTURAL ANALYSIS:** Static and Kinematic Indeterminacy of Structures – Equilibrium and Compatibility Conditions
**FLEXIBILITY METHOD:** Flexibility Methods – Applications to Continuous Beams (Degree of Static Indeterminacy Not Exceeding Three)
**STIFFNESS METHOD:** Introduction – Application to Continuous Beams (Degree of Kinematic Indeterminacy Not Exceeding Three)

**UNIT - V**
**PLASTIC ANALYSIS:** Theory of Plastic Bending - Idealized Stress - Strain Diagram - Shape Factor - Moment Vs Curvature Relationships - Plastic Hinges - Collapse Mechanisms - Analysis of Fixed and Continuous Beams and Portal Frames - Statically Method and Mechanism Method of Analysis.

**TEXT BOOKS:**
1. *Structural Analysis – Vol. 1 & Vol. 2* by Bhavikatti, S.S, Vikas Publishing Pvt Ltd., New Delhi, 2008
2. *Comprehensive Structural Analysis – Vol. 1 & Vol. 2* by Vaidyanadhan, R and Perumal, P, Laxmi Publications Pvt. Ltd, New Delhi, 2003

**REFERENCES:**
1. *Theory of structures* by Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications Pvt. Ltd., New Delhi.
2. *Structural Analysis* by L.S. Negi & R.S. Jangid, Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.

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**(16CE126) Design & Drawing of Steel Structures**

*Course Objectives:*
- *The student should get familiarized with limit state design concept of steel structures using relevant IS code.*
- *Student should get trained to design tension, compression and flexural members using IS 800 – 2007.*

*Course Outcomes: On completion of this course, the student will be able to*
- *Design of riveted, welded and bolted connections*
- *Design of tension members*
- *Design of compression members, slab base and gusseted base for columns*
- *Design of laterally supported and unsupported beams*
- *Design of roof truss*

**UNIT – I**
**INTRODUCTION**: Structural steel - Properties of Sections- Types of Loads - Permissible Stresses for Structural Steel in Tension, Compression, and Shear as per IS Code.
**RIVETED CONNECTIONS**: Introduction- Simple Connections – Lap and Butt Joints-Failure of Riveted Joints-Strength of a Riveted joint
**BOLTED CONNECTIONS:** Introduction – Behavior of Bolted Joints – Design Strength of Ordinary Black Bolts – Design Strength of High Strength Friction Grip Bolts – Simple Connections – Lap and Butt Joints
**WELDED CONNECTIONS:** Introduction – Advantages and Disadvantages of Welding – Strength of Welds – Welded Connections with Butt and Fillet Welds

**UNIT – II**
**TENSION MEMBERS:** Types of Tension Members -Net Effective Section for Angles and Tees in Tension – Design of Tension Member - Lug Angles- Tension Splice.

**UNIT – III**
**COMPRESSION MEMBERS:** Simple and Built Up Compression Members – Assumptions Related to End Conditions – Design of Built Up Columns with Battens and Laces – Concept of Column Splicing - Design of Slab Base and Gusseted Base for Columns

**UNIT – IV**
**BEAMS:** 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

**UNIT – V**
**ROOF TRUSSES:** Loads on Roof Trusses – Design of Purlins – Design of Members of Roof Truss – Angular and Tubular Members – Design of Connection of Members.

**Note**: The students should prepare the following plates:
    Plate 1 Detailing of simple beams and compound beams
    Plate 2 Detailing of Column including lacing
    Plate 3 Detailing of Column including battens

Plate 4 Detailing of Column bases – Slab base
Plate 5 Detailing of Column bases – Gusseted base

## Examination Pattern

**Mid Exam:** The mid examination paper consists of Part A and Part B. Part A consists of two questions, each one comprised of both design and drawing, out of which one question is to be answered. Part B should consist of three questions on design out of whichtwo are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

**End Exam:** The end examination paper should consist of Part A and Part B. Part A consists of two questions, each one comprised of both design and drawingout of which one question is to be answered. Part B consists 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. *Limit State Design of Steel Structures* by S.K. Duggal [2014], Tata, McGraw Hill, New Delhi.
2. *Design of Steel Structures* by S.S. BhavikattiI.K. International Publishing House Pvt.Ltd, New Delhi.

## REFERENCES:
1. *Design of Steel Structures* by N. Subramanian, Oxford university press
2. *Structural Design and Drawing* by N. Krishna Raju, University press, Hyderabad.
3. *Limit state Design of steel structures Vol.1* by Dr. Ramachandra & Virendra Gehlot Scientific Publishers (India), Jodhpur

**IS Codes:** IS 800 – 2007, Steel Tables.
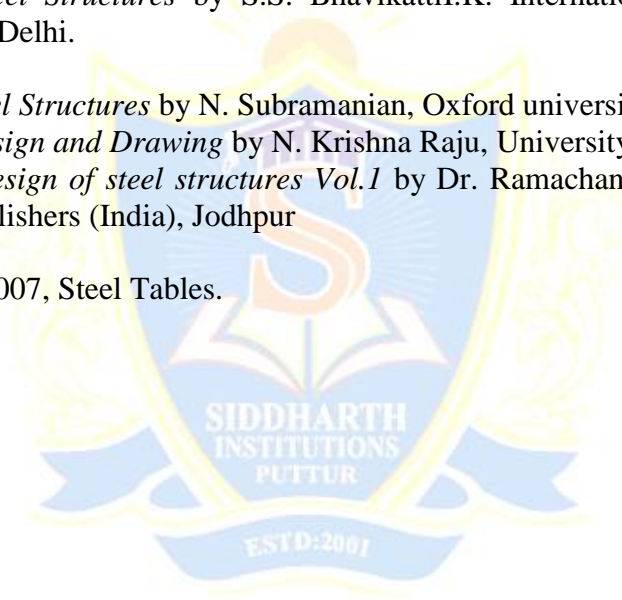
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**(16CE127) Geotechnical Engineering - II**

*Course Objectives: To understand*
- *Different methods of soil exploration and compaction.*
- *Stability of earth slops*
- *The concepts involved in computing lateral earth pressures on retaining walls.*
- *Bearing capacity and settlement of shallow foundations.*
- *The load-carrying capacity of pile foundations and settlement of pile groups.*

*Course Outcomes: After completion of the course, the student will be able to*
- *Apply the knowledge of compaction in selecting the compaction equipment.*
- *Analyze the stability of earthen slopes*
- *Evaluate the probable settlements of foundations and SBC of soils.*
- *Estimate load carrying capacity of piles*
- *Understand the design principles of a gravity retaining wall.*
- 

**UNIT – I**
**SOIL EXPLORATION:** Need – Methods of Soil Exploration – Boring and Sampling Methods – Penetration Tests – Planning of Programme and Preparation of Soil Investigation Report.

**UNIT – II**
**EARTH SLOPE STABILITY:** Infinite and finite earth slopes – Type 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 ON RETAINING WALLS:** Introduction – Plastic Equilibrium in Soils – Active and Passive States – Earth Pressure at Rest– Rankine's Theory – Coulomb's Wedge Theory – Culmann's and Rebhann's GraphicalMethods for Active Earth Pressure – Stability Considerations for Gravity Retaining Walls
.

**UNIT - IV**
**BEARING CAPACITY:** Types and choice of foundation – Depth of foundation – Types of shear failures – safe bearing capacity – Terzaghi's analysis – Meyerhof's analysis – Skempton's analysis – IS Method – Effect of water table on bearing capacity - Plate load test.
**SETTLEMENT:** Types of settlement – Tolerable settlements – Allowable soil pressure for both cohesion less and cohesive soils.

**UNIT V:**
**PILE FOUNDATIONS:** Necessity – Classification – Load carrying capacity of piles – Static methods – Dynamic formulae – Insitu penetration tests – pile load tests – Negative skin friction – group action inpiles – Settlement of pile groups.

**TEXT BOOKS:**
1. *Geotechnical Engineering* by C. Venkataramiah, New age International Pvt. Ltd,
2. *Soil Mechanics and Foundation* by B.C. Punmia, Ashok Kumar Jain and Arum Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi\

**REFERENCES:**
1. *Geotechnical Engineering* by V.N.S. Murthy, CRC Press, New York, Special Indian Edition
2. *Geotechnical Engineering* by Brije.M. Das, Cengage Publications, New Delhi
3. *Basic and Applied Soil Mechanics* by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi.
4. *Soil Mechanics and Foundation Engg.* by K.R. Arora, Standard Publishers

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### (16CE128) Water Resources Engineering-II

**Course Objectives:**

- *The fundamental idea behind this course is to make student aware of canal regulation works, cross drainage works and concepts of river engineering.*
- *The course also targeted to teach students the concepts of major irrigation structures such as gravity dams, earthen dams and its prerequisites namely reservoir planning.*

**Course Outcomes:**

*After completion of the course the student is a position to*

- *Understand canal regulation systems*
- *Understand designing of cross drainage works*
- *Be familiar with river engineering concepts*
- *Plan the reservoir*
- *Perform hydraulic design of gravity*

**UNIT I**

**CANAL REGULATION WORKS:** Canal falls- Necessity and location of falls- Types of falls-
Classification of falls- Cistern design-Roughening devices- Design of sarada 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.

**UNIT III**

**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 IV**

**RESERVOIR PLANNING**: Introduction- Investigations for reservoir planning- Selection of site or 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).

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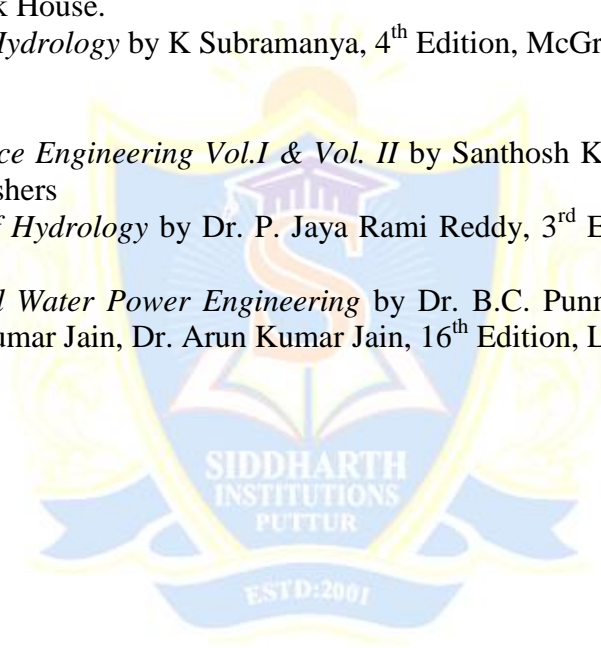
**GRAVITY DAMS:** Introduction- Forces acting on a gravity dam- Combination of loading for design- Modes of failure- Stability requirements- Principal and shear stresses- Stability analysis- Elementary profile of a gravity dam- Practical profile of a gravity dam- Limiting height of a gravity dam- High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

**TEXT BOOKS:**
1. *Irrigation Water Resources and Power Engineering,* by Dr. P.N. Modi, 9th Edition, Standard Book House.
2. *Engineering Hydrology* by K Subramanya, 4th Edition, McGraw Hill Publication.

**REFERENCES:**
1. *Water Resource Engineering Vol.I & Vol. II* by Santhosh Kumar Garg, 23rd Edition, Khanna Publishers
2. *A Textbook of Hydrology* by Dr. P. Jaya Rami Reddy, 3rd Edition: Publisher: Laxmi Publications
3. *Irrigation and Water Power Engineering* by Dr. B.C. Punmia, Dr. Pande Brij Basi Lal, Ashok Kumar Jain, Dr. Arun Kumar Jain, 16th Edition, Laxmi Publications.

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**(16CE129) Transportation Engineering - I**

*Course Objectives:*
- *To know the historical development of highways.*
- *To analyze and compare the various engineering surveys for highway location.*
- *To familiarize with various elements and geometric design of highways*
- *To know the various properties of highway materials*
- *To learn the various aspects of pavement design.*

*Course Outcomes:*
*After completion of the course the student will have:*
- *To apply the knowledge of highway materials in the design of the pavements.*
- *To design the various highway pavements.*
- *To estimate the geometrics for highway pavements.*

**UNIT- I**
**ROAD TRANSPORTATION:** Importance of Transportation - Modes of Transportation - Characteristics of Road Transport - Historical Development of Road Construction - Highway Development in India   - Necessity of Highway Planning - Classification of roads - Road Patterns.
**HIGHWAY ALIGNMENT AND SURVEYS:** Highway Alignment - Basic Requirements - Controlling Factors - Engineering Surveys for Highway Location - Drawings and Report - Preparation of Plans - Interpretation of Planning Surveys - Preparation of Master Plans & Its Phasing- Steps in a New Project Work.

**UNIT- II**
**HIGHWAY GEOMETIC DESIGN:** Importance of Geometric Design - Design Controls and   Criteria- Highway Cross Section   Elements: Pavement Surface Characteristics, Friction, Factors affecting Friction or Skid   Resistance, Pavement Unevenness, Light Reflecting Characteristics, Cross Slope or Camber: Shape of Cross Slope, Providing Chamber in the Field, Width of Pavement or Carriageway - Kerbs - Road Margins - Width of Road or Formation-Sight Distance, Stopping Sight Distance -Overtaking Sight Distance - Sight distance at Intersections - Design of Horizontal Alignment: Design speed - Horizontal Curves - Super elevation & Super elevation Design, Radius of Curve, Widening of Pavement on Horizontal Curve, Set-back Distance on Horizontal Curve - Curve Resistance - Design of Vertical Alignment:  Gradient, Vertical Curves.

**UNIT - III**
**TRAFFIC ENGINEERING:** Scope - Road User and Vehicle Characteristics - Traffic Studies (Uses, Field Methods and Presentation of Data Only) Volume – Speed - Origin and Destination – Flow – Capacity – Parking – Accidents - Traffic Regulations Control Devices - Signs and Signals - Road Markings – Islands - Design of Intersections - Highway Lighting.

**UNIT - IV**
**HIGHWAY MATERIALS:** Aggregates and Bitumen - Desirable Properties - Tests, Specifications, Aggregate bitumen Mixes - Desirable Properties, Design by Marshall Method.

**UNIT - V**

**PAVEMENT DESIGN:** Types - Components and their Functions - Design Factors - Flexible Pavement Design - IRC Methods Based on CBR only - Rigid Pavement Design - Calculation of Stresses - Design of Joints - Dowel Bars - Tie Bars - Thickness of Pavement by IRC Procedure.

**TEXT BOOKS:**
1. *Highway Engineering* by S.K. Khanna& C.E.G. Justo, A. Veeraragavan, 10th Edition Khanna Publisher,
2. *Traffic Engineering & Transportation Planning* by Kadyali, L.R. 8$^{th}$Edition. Khanna Publications.

**REFERENCES:**
1. *Text book of Highway Engineering* by R.Srinivasa Kumar, Universities Press,
2. *Introduction to Transportation Engineering,* James H Banks, 2$^{nd}$Edition, Tata McGraw hill publications, New Delhi
3. *Transportation Engineering* by L.R.Kadiyali, 1$^{st}$Edition, Khanna Publications, (2016).

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**(16CE130) Geotechnical Engineering Lab**

*Course objectives:*
- *The lab provides knowledge on conducting experiments on index and engineering properties of soil.*

*Course outcomes:*

*After successful completion of this laboratory course the student is in a position to:*
- *Understand the difference between disturbed and undisturbed soil samples*
- *Evaluate the consistency limits for fine grained soils*
- *Find coefficient of permeability for fine and coarse grained soils*
- *Determine maximum dry density at optimum moisture content*
- *find shear strength of both cohesive and non-cohesive soils*

**LIST OF EXPERIMENTS:**
1. Specific Gravity.
2. Field Density-Core Cutter and Sand Replacement Method
3. Grain Size Analysis
4. Atterberg Limits (LL, PL & SL)
5. Permeability of Soil, Constant and Variable Head Test
6. Compaction Test
7. CBR Test
8. Consolidation Test
9. Unconfined Compression Test
10. Tri-axial Compression Test
11. Direct Shear Test.

.

**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, Khanna Publishers, New Delhi.
3. Relevant IS Codes

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## (16CE131) Transportation Engineering Lab

*Course objectives:*
- *The purpose of this lab is to make student understand the quality and tests to access quality of road laying materials namely bitumen and aggregate.*
- *The lab also help student to take the data necessary to design the road pavement.*

*Course outcomes:*

*After completion of this labs student:*
- *Can conduct tests related to road aggregate*
- *Can conduct tests related to bitumen*
- *Can perform traffic volume studies*
- *Can perform vehicle speed studies.*

**LIST OF EXPERIMENTS**
### 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:
6. Penetration Test
7. Ductility Test
8. Softening Point Test
9. Flash and Fire Point Tests

### III. TRAFFIC FIELD STUDIES
10. Traffic Volume Studies at Mid-block and Data Analysis
11. Traffic Volume Studies at Intersection and Data Analysis
12. Speed Studies and Data Analysis

**TEXT BOOKS: -**
1. *Highway Materials Testing Laboratory Manual* by S.K. Khanna and C.E.G Justo, New 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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**(16HS615) Advanced English Language and Communication Skills Lab**

*Course Objectives:*

*This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:*

- *To improve the students' fluency in English, through a well-developed vocabulary*
- *To enable them listening spoken English at normal conversational speed by educated English speakers*
- *To respond appropriately in different social-cultural and professional contexts*
- *To develop drafting skills among the students.*

*Course Outcomes:*

- *Flair in Writing and felicity in written expression*
- *To enhance job prospects*
- *Improving Effective Speaking Abilities*
- *To prepare effective Interview techniques*

**UNIT I: COMMUNICATIVE COMPETENCY:**
1. Reading Comprehension
2. Listening Comprehension
3. Vocabulary for competitive purpose
4. Spotting Errors

**UNIT II: TECHNICAL WRITING**
1. Report writing
2. Curriculum vitae
3. Cover Letter
4. E-mail writing

**UNIT III: PRESENTATIONAL SKILLS**
1. Oral presentation
2. Power point presentation
3. Poster presentation
4. Stage Dynamics

**UNIT IV: CORPORATE SKILLS**
1. Dress code
2. Telephonic skills
3. Net-etiquettes
4. Video conferencing and Chairing Session

**UNIT V: GETTING READY FOR JOB**
1. Group Discussion
2. Debate
3. Interview skills
4. Psychometric test.

**Minimum Requirements for Advanced Professional Communication Skills 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:**
iii) Clarity Pronunciation Power – Part I (Sky Pronunciation)
iv) Clarity Pronunciation Power – Part II
v) K – Van Advanced Communication Skills
vi) Walden Info Tech Software.

**REFERENCES:**
1. *Effective Tech Communication*, Rizvi, Tata McGraw – Hill Education, 2007.
2. *Communication skills*, Sanjay Kumar & Pushpalatha, Oxford University Press, 2012.
3. *Writing Tutor*. *Advanced English Learners' Dictionary*, 9th Edition, Oxford Universty Press, 2015.
4. *Powerful Vocabulary Builder*, Anjana Agarwal, New Age International Publishers, 2011.
5. *Listening Extra*, Miles Craven, Cambridge University Press, 2008.
6. *Reading Extra*, Liz Driscoll, Cambridge University Press, 2004.
7. *Writing Extra*, Graham Palmer, Cam Cambridge University Press, 2004.
8. *Speak Well*, Jayashree Mohanraj et al, Orient Blackswan, 2013.

**Mode of Evaluation:** Written Examination, Day-to-day Assessment

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(16MB750) **Managerial Economics and Financial Analysis**

*Course objectives:*
- The objectives of this course are to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to enrich analytical skills in helping them take sound financial decisions for achieving higher productivity.

*Course outcomes:*
- The thorough understanding of Managerial Economics and Analysis of Financial statements facilitates the technocrats –cum- entrepreneurs to take up decisions effectively and efficiently in the challenging Business Environment.

**UNIT I - INTRODUCTION TO MANAGERIAL ECONOMICS**
Managerial Economics - Definition, nature and scope – contemporary importance of Managerial Economics - Demand Analysis: Determinants- Law of Demand - Elasticity of Demand. Significance –Types – measurement of elasticity of demand - Demand forecasting-factors governing demand Forecasting- methods of demand forecasting –Relationship of Managerial Economics with Financial Accounting and Management.

**UNIT II - THEORY OF PRODUCTION AND COST ANALYSIS**
Production Function – Short-run and long- run production - Isoquants and Isocosts, MRTS, least cost Combination of inputs - Cobb-Douglas production function - laws of returns - Internal and External Economies of scale - **Cost Analysis**: Cost concepts - Break-Even Analysis (BEA) – Managerial Significance and limitations of BEA - Determination of Break Even Point (Simple Problems)

**UNIT III - INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT**
Market structures: Types of Markets - Perfect and Imperfect Competition - Features, Oligopoly -Monopolistic competition. Price-Output determination - Pricing Methods and Strategies. New Economic Environment- Economic systems – Economic Liberalization – Privatization and Globalization

**UNIT IV - CAPITAL AND CAPITAL BUDGETING**
Concept of Capital - Over and under capitalization – Remedial measures - Sources of Short term and Long term capital - Estimating Working Capital requirement – Capital budgeting – Features of Capital Budgeting proposals – Methods and Evaluation of Capital budgeting – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**UNIT V - 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 – Techniques – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

**TEXT BOOKS:**
*1. Aryasri:* Managerial Economics and Financial Analysis, 4/e, TMH, 2009.
*2. Varshney &Maheswari:* Managerial Economics, Sultan Chand, 2009.

**REFERENCES:**

*1. Premchand Babu, Madan Mohan:*Financial Accounting and Analysis, Himalaya, 2009
*2. S.A. Siddiqui and A.S. Siddiqui:* Managerial Economics and Financial Analysis, New Age International,. 2009.
*3. Joseph G. Nellis and David Parker:* Principles of Business Economics, Pearson, 2/e, New Delhi.
*4. Domnick Salvatore:* Managerial Economics in a Global Economy, Cengage, 2009.
*5. H.L.Ahuja:* Managerial Economics, S.Chand, 3/e, 2009

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### (16CE132) Transportation Engineering-II

*Course Objectives:*
- *To have the knowledge of highway drainage.*
- *To understand the various components of Railway Engineering, Airport Engineering, Dock and Harbor Engineering*

*Course Outcomes:*
*After completion of the course the student will have:*
- *Able to design and construct different construction and maintenance.*
- *To analyze, design different components of Railway Engineering, Airport Engineering, Dock and Harbor Engineering*

**UNIT I:**
**CONSTRUCTION AND MAINTENANCE:** Construction and Maintenance of Earth, Gravel, W.B.M., Bituminous and Concrete Roads.
**HIGHWAY DRAINAGE**: Importance, Surface and Subsurface Drainage Methods.

**UNIT II**
**RAILWAY ENGINEERING:** Comparison of Railway and Highway Transportation, Classification of Indian Railways, Engineering Surveys: Permanent Way - Gauges, Components, Cross sections, Coning of wheels, Ballast types.

**UNIT III**
**DESIGN OF RAILWAY ENGINEERING:** Site Selection, Classification and Layout of Different Stations, Station Yards. Points and Crossings: Types of Crossings -Types of switches - Design of turnouts, Factors affecting speed at turnouts, Important terms used in points and Crossings.

**UNIT IV**
**AIRPORT ENGINEERING:** Airport Planning - Master Plan, Regional Planning, Data for Site Selection. Site Selection, Surveys, Drawings, Estimation of future air traffic needs. Airport layout and terminal area - Terminal area, Building area, parking area, Blast Considerations, Typical airport layouts and their features-Evaluation of air field pavements and Methods of strengthening.

**UNIT V**
**DOCK AND HARBOUR ENGINEERING:** Water transportation, Harbors and types of Harbors, Site Selection, Ports, Classification of ports. Docks - Types, Shapes of docks, dock Entrances, Repair Docks, Break Water, types of break waters, Quays, Jetties,Wharves, Dolphis, Fender systems, Aprons, Transit Sheds and Ware Houses, Dredging.

**TEXT BOOKS:**
1. *Highway Engineering* by S.K. Khanna& C.E.G. Justo, A. Veeraragavan, 10th Edition, Khanna Publisher.
2. *A text book of Railway Engineering* by S.C. Saxena, and S.P. Arora, Dhanpat, 7th Edition, Rai Publications, Pvt. Ltd. New Delhi.

3. *Airport Planning and Design* by Khanna, S.K., Arora, M.G and Jain,6th Edition,S.S, Nem Chand.
4. *A Course in Docks and Harbor Engineering* by S.P. Bindra, 5th Edition, Dhanpat Rai Publications.

**REFERENCES:**
1. *Harbor, Dock and Tunnel Engineering* by R. Srinivasan, 28th Edition, Charotar Publishing House Pvt. Limited,
2. *Airport Engineering* by Rangwala, 16th Edition, Charotar Publishing.
3. *Railway Engineering* by Satish Chandra and Agarwal, M.M, 1st Edition, Oxford Higher Education University Press New Delhi.
   4. *Railway Track Engineering* by J.S. Mundrey, 4th Edition, Tata McGraw-Hill Education.

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**(16CE133) Environmental Engineering**

*Course Objectives:*
- *To teach students the basic principles and concepts of unit operations and processes involved in water and wastewater treatment.*
- *To develop a student's skill in the basic design of unit operations and processes involved in water and wastewater treatment.*
- *To develop a student's skill in evaluating the performance of water and wastewater treatment plants.*

*Course Outcomes:*
*Students undergoing this course are able to*
- *Demonstrate an ability to recognize the type of unit operations and processes involved in water and wastewater treatment plants.*
- *Recognize that water supply and sanitation is an important professional and ethical responsibility of civil and environmental engineer.*
- *Demonstrate an ability to choose the appropriate unit operations and processes required for satisfactory treatment of water and wastewater.*
- *Demonstrate an ability to design individual unit operation or process appropriate to the situation by applying physical, chemical, biological and engineering principles.*

**UNIT I**
**INTRODUCTION TO WATER SUPPLY:** Importance and Necessity of Protected Water Supply Systems-Objectives of Protected water supply system- Flow chart of public water supply system
**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-Methods of Population Forecasting, Sources of water-Surface and Sub-surface sources-Hydrologic Cycle-Factors governing the selection of source of water-Intakes-Types of intakes-factors

**UNIT – II**
**QUALITY AND ANALYSIS OF WATER:** Characteristics of water – Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological- Water borne diseases- Drinking water quality standards.
**WATER TREATMENT:** Layout and general outline of water treatment units –Screening-Types of screens-Sedimentation-principles – design factors – Coagulation-Methods of feeding coagulation-Flocculation-Filtration –theory–classification of filters –Comparison-design of filters–Disinfection–Methods-Chlorination-Forms-Break point chlorination-Water Softening-Hardness-Types- Methods of removal of hardness
**ADVANCED WATER TREATMENT:** Iron and Manganese removal-Defluorination-Desalination

**UNIT – III**
**WATER DISTRIBUTION:** Distribution systems – Requirements-Methods of distribution-Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe

methods-Service reservoirs – Laying and testing of pipe lines – Pump house- Waste detection and prevention–House service connection

**INTRODUCTION TO SANITATION**: Sources of waste water generation-System of sanitation–collection and conveyance of waste water – Sewerage – classification of sewerage systems

**ESTIMATION OF SEWAGE FLOW:** Estimation of sewage flow and storm water drainage –D.W. F-Factors affecting DWF- Hydraulics of sewers and storm drains– design of sewers – materials for sewers- appurtenances in sewerage – cleaning and ventilation of sewers.

**UNIT – IV**

**WASTE WATER CHARACTERSTICS:** Characteristics of sewage – Physical, Chemical and Biological-Decomposition of sewage, examination of sewage – Biological Oxygen Demand-Chemical Oxygen Demand

**WASTE WATER TREATMEN:** Layout and general outline of various units in a waste water treatment plant – Primary treatment: Screens – Grit Chambers – Skimming tanks – Sedimentation tanks – principles & design – Secondary treatment – Activated sludge process-Trickling filters – standard and high rate trickling filters-Comparison– Construction and design of Oxidation ponds.

**UNIT – V**

**DISPOSAL OF SEWAGE AND SLUDGE TREATMENT:** Methods of waste water disposal-Self-purification –Oxygen sag curve-Sludge treatment processes-flow chart- Sludge thickening and digestion – factors effecting – Design of Digestion tank –sludge conditioning
**DISPOSAL OF SLUDGE**
Sludge dewatering- disposal of sludge – Methods-Septic tanks and Imhoff Tanks, working principles and design – Soak pits and Dispersion trench

**TEXT BOOKS:**
1. *Water supply and sanitary Engineering* by G.S. Birdi, Dhanpat Rai & Sons Publishers
2. *Water Supply Engineering, Vol. 1*by B.C. Punmia, Ashok Jain & Arum Jain, Laxmi Publications Pvt. Ltd, New Delhi
3. *Waste Water Engineering, Vol. II*by B.C. Punmia, Ashok Jain & Arum Jain, Laxmi Publications Pvt. Ltd, New Delhi


**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

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**(16CE134) Estimation, Costing and Valuation**

*Course Objective:*
- *The objective of this course to make the student aware of estimating and costing process involved in civil engineering structures and various procedures associated with valuing buildings.*

*Course Outcome:*
- *Explain types of estimate and duties of an Estimator*
- *Undertake rate analysis of civil engineering works*
- *Determine the rates of various items of civil works*
- *Calculate estimated cost of civil construction projects*
- *Evaluate the actual value of any property.*

**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.
**STANDARD 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* by B.N. Dutta, UBS publishers, 2000.
2. *Contracts and estimations* by B.S. Patil, Universities. Press, Hyderabad.
3. *Estimation, Costing and Specifications* by M. Chakraborthi, Laxmi publications.

**REFERENCES:**
1. *Standard Schedule of rates and standard data book by* public works department.
2. *I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil engineering works – B.I.S.)*

3. *Estimating and Costing by* G.S. Birdie
4. *National Building Code*

**Note:** Standards scheduled of Rates is permitted in the examination hall.

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**(Department Elective – I)**
**(16CE135) Finite Element Methods in Civil Engineering**

*Course Objectives:*
- *To provide the fundamental concepts of the theory of the finite element method*
- *To understand the analysis of Structures of first of kind.*
- *To study the application of the matrix method of analysis to the FEM of analysis concept.*

*Course Outcomes:*
*Students undergoing this course are able to*
- *Obtain an understanding of the fundamental theory of the FEA method*
- *Develop the ability to generate the governing FE equations for systems governed by partial differential equations*
- *Understand the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements*
- *Understand the application and use of the FE method for heat transfer problems.*

**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**
**ELEMENT PROPERTIES:** Different Types of Elements - Displacement Models - Relation Between Nodal Degrees of Freedom and Generalized Coordinates - Geometric Invariance - Natural Coordinate Systems - Introduction to Shape Functions - Element Strains and Stresses - Element Stiffness Matrix - Classification Isoparametric, Sub-Parametric, Super-Parametric Elements.

**UNIT - III**
**SHAPE FUNCTIONS** Introduction - Polynomial Shape Functions - Convergence Requirements; Compatibility Requirement of Shape Functions – Shape Function for Different Elements - Derivation of Shape Functions Using Polynomials - Finding Shape Functions Using Lagrange Polynomials - Shape Functions for Serendipity Family Elements

**UNIT - IV**
**BARS AND TRUSSES:** Introduction – Generation of Element Stiffness Matrix - Tension Bars/Columns - Two Dimensional Trusses – Numerical Problems.
**PLANE-STRESS AND PLANE-STRAIN ANALYSIS:** Introduction – Generation of Element Stiffness Matrix - Solving Plane Stress and Plane-Strain Problems Using Constant Strain Triangle

## UNIT – V

**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

## TEXT BOOKS:

1. *Finite element* analysis by S.S. Bhavakatti-New age international publishers
2. *Introduction to Finite Element in Engineering* by T R Chandrupatla and A D Belegundu University Press, India.

## REFERENCES:

1. *Finite element Analysis*by Dr.S. Senthil and R. Panneerdhass Publication: Lakshmi Publications, Chennai.
2. *Concepts and Applications of Finite Element Analysis* by Robert D. Cook, David S. Malkus and Michael E. Plesha. John Wiley & Sons.
3. *Finite Element Analysis* by Theory and Programming- Krishnamurthy-Tata McGraw Hill Co. Ltd. New Delhi.
4. *Finite element analysis* by David V Hutton, Tata McGraw Hill, New Delhi
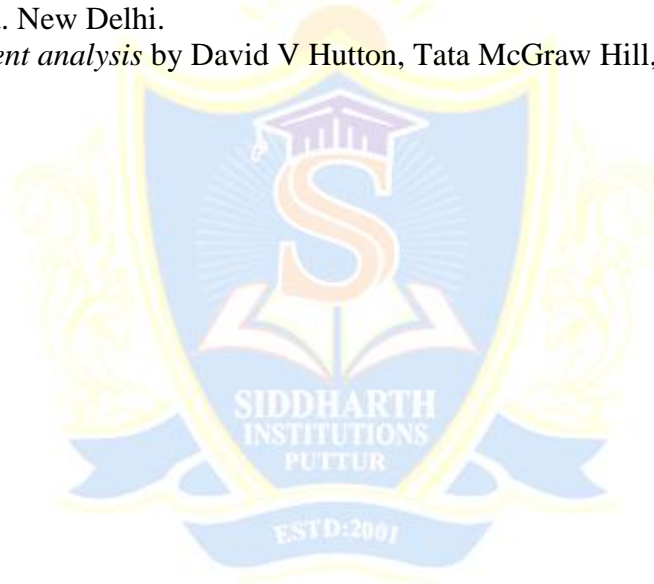
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**(Department Elective – I)**
**(16CE136) Remote Sensing & GIS**

*Course Objectives:*
- *To provide students the Photogrammetric techniques, concepts, components of Photo grammetry.*
- *To introduce the students to the basic concepts and principles of various components of remote sensing. To provide an exposure to GIS and its practical applications in Civil Engineering Analyze the energy interactions in the atmosphere and earth surface features*

*Course Outcomes:*
*On completion of the course the students will have knowledge on*
- *Principles of Remote Sensing and GIS*
- *Analysis of RS and GIS data and interpreting the data for modeling applications*

**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 by Satheesh Gopi, Pearson Publication.
2. *Basics of Remote sensing & GIS* by S. Kumar, Laxmi Publications.
3. *Remote sensing and GIS* by M. Anji Reddy, B.S. Publications, New Delhi.
4. *GIS* by Kang, Tsung Chang, TMH Publications & Co.,

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**(Department Elective – I)**
**(16CE137) Air Pollution & Management**

**Course Objectives:**
- This subject covers the sources, characteristics and effects of air and noise pollution and the methods of controlling the same.
- The student is expected to know about source inventory and control mechanism.

**Course Outcomes:**
On completion of the course, the students will be able to:
- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.

**UNIT I:**
**SOURCES AND EFFECTS OF AIR POLLUTANTS**: Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

**UNIT II:**
**DISPERSION OF POLLUTANTS**: Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

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

**UNIT IV:**
**AIR QUALITY MANAGEMENT**: Air quality standards – Air quality monitoring – Preventive measures – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

**UNIT V:**
**NOISE POLLUTION**: Sources of noise pollution – Effects – Assessment – Standards – Control methods – Prevention

**TEXTBOOKS:**

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

**REFERENCES:**

1. *Heumann. W.L.*, "Industrial Air Pollution Control Systems", McGraw Hill, New Yark, 1997.
2. *Mahajan S.P.*, "Pollution Control in Process Industries", Tata McGraw Hill Publishing Company, New Delhi, 1991.
3. *Peavy S.W., Rowe D.R. and Tchobanoglous G*. "Environmental Engineering", McGraw Hill, New Delhi, 1985.

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**(Open Elective)**
**(16EE239) Neural Networks & Fuzzy Logic**

**Course Objectives:**
- This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
- It deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components.
- The Neural Network and Fuzzy Network system application is presented. This subject is very important and useful for doing Project Work.
- The main objective of this course is to provide the student with the basic understanding of neural networks and fuzzy logic fundamentals.

**Course Outcomes:**
At the end of the course the student will be able to
- Understand the basic concept of biological neural networks
- Understand the basic concept of artificial neural networks
- Create Neural Network models.
- Understand the basic concepts of fuzzy logic.
- Create Fuzzy models.

**UNIT - I: FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS**
Neural networks - introduction, artificial neural network, advantages, biological neural network, architectures of artificial neural networks -activation functions, important terminologies of ANN, McCulloch - Pitts neuron model, learning strategies - supervised, unsupervised, reinforced.

**UNIT - II: SUPERVISED, UNSUPERVISED NETWORKS**
Learning rules - Hebbian learning rule, perceptron learning rule, delta learning rule, widow - hoff learning rule, Back propagation neural network-architecture, training algorithm, learning factors - initial weights, leaning constant, Perceptron Neural Network- architecture, training algorithm. Applications of Neural Networks (any one problem).

**UNIT - III: ASSOCIATIVE MEMORIES**
**Associative memories:** concepts, Bidirectional Associative Memory (BAM) - architecture, discrete BAM - testing algorithm, analysis of hamming distance, energy function and storage capacity. Discrete Hopfield network architecture and training algorithm.

**UNIT - IV: CLASSICAL AND FUZZY SETS**
Introduction to classical sets-properties–Fuzzy vs crsip-Fuzzy sets , Membership functions, basic fuzzy set operation ,properties of fuzzy sets- Fuzzy relations –Fuzzy Cartesian product, operations on fuzzy relations.

**UNIT -V: FUZZY LOGIC SYSTEMS**

Fuzzification – Fuzzy quantifiers, fuzzy inference, fuzzy rule based system - development of rule base and decision making system - Defuzzification to crisp sets - Fuzzification and Defuzzification methods. Applications of Fuzzy logic systems (any one problem)

**TEXTBOOKS:**

1. S.N. Sivanandam, S.N. Deepa, Principles of Soft computing, Wiley India private Ltd., 2nd edition, 2013.
2. Timothy J Ross, Fuzzy Logic with Engineering Application, McGraw Hill Inc.1997.

**REFERENCES:**

1. Jacek M. Zurada, Introduction to Artificial Neural Networks, Jaico Publishing House.
2. Simon Haykin, Neural Networks - A Comprehensive Foundation, Prentice- Hall Inc, 1999

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**(Open Elective)**
**(16ME313) Non-Conventional Energy Resources**

**Course Objectives:**

- To Understand and analyze the pattern of renewable energy resources Suggest methodologies / technologies for its utilization Economics of the utilization and environmental aspects.

**Course Outcomes:**

- Upon completion of this course, the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.

**UNIT I: Introduction** -World Energy Use – Classification of Energy's-Reserves of Energy Resources – Environmental Aspects of Energy Utilization – Need of Renewable Energy– Renewable Energy Scenario in Andra Pradesh, India and around the World.

**UNIT II: Solar Energy** -Solar Radiation – Measurements of Solar Radiation - Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation - Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.

**UNIT III: Wind Energy** - Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.

**UNIT IV: Bio – Energy**- Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration - Biomass Applications

**UNIT V**: **Other Sources of Energy** - Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage - Fuel Cell Systems – Hybrid Systems.

**TEXT BOOKS:**
1. Rai. G.D., "Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 2011.
2. Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006.

**REFERENCES:**
1. Sukhatme. S.P., "Solar Energy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
2. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 1996.
3. Tiwari. G.N., Solar Energy – "Fundamentals Design, Modelling & Applications", Narosa Publishing House, New Delhi, 2002.
4. Freris. L.L., "Wind Energy Conversion Systems", Prentice Hall, UK, 1990.
5. Johnson Gary, L. "Wind Energy Systems", Prentice Hall, New York, 1985
6. David M. Mousdale – "Introduction to Biofuels", CRC Press, Taylor & Francis Group, USA 2010
7. Chetan Singh Solanki, Solar Photovoltaics, "Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2009.

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**(Open Elective)**
**(16EC443) Matlab Programming**

**Course Objectives:**
- Understand the MATLAB Desktop, Command window and the Graph Window
- Be able to do simple and complex calculation using MATLAB
- Be able to carry out numerical computations and analyses
- Understand the mathematical concepts upon which numerical methods
- Ensure you can competently use the MATLAB programming environment
- Understand the tools that are essential in solving engineering problems

**UNIT-I**
Introduction to MATLAB, MATLAB Interactive Sessions, Menus and the toolbar, computing with MATLAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MATLAB

**UNIT-II**
Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays

**UNIT-III**
Functions & Files Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

**UNIT-IV**
Programming with MATLAB Program Design and Development Relational Operators and Logical Variables Logical Operators and Functions Conditional Statements for Loops while Loops the switch Structure Debugging MATLAB Programs Applications to Simulation, Problems

**UNIT-V**
Plotting Functions Additional Commands and Plot Types Interactive Plotting in MATLAB Three-Dimensional Plots Summary, Problems

**TEXT BOOKS:**
1. G. H. Golub and C. F. Van Loan, "Matrix Computations", 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, "Numerical Linear Algebra and Applications", Brooks/Cole, 1994 (out of print)
3. L.Elden, "Matrix Methods in Data Mining and Pattern Recognition", SIAM Press, 2007 Misc

**REFERENCES:**
1. NA-digest, http://www.netlib.org/na-digest-html
2. Society for Industrial and Applied Mathematics (SIAM), see http://www.siam.org
3. Google "MATLAB Primer" or "MATLAB Tutorial" and you should be able to access lots of free MATLAB.

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**(Open Elective)**
**(16CS511) Database Management Systems**

**Course Objective:**
- To provide the student with clear conceptual understandings related to databases.
- After this course, the student should gain knowledge in the relational model, SQL, database design storage & indexing, failure recovery and concurrency control.

**Course Outcome:**
- Students can design the simple database, and can use the SQL instructions in developing the database applications.
- Can apply the ER concepts to design the databases.
- Advanced concepts like triggers, assertions and constraints can be applied effectively in designing the business applications

**UNIT-I**
**Introduction-**Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems.
**Introduction to Data base design:** ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, and Conceptual Design for Large enterprises.
**Relational Model:** Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views destroying/ altering Tables and Views.

**UNIT-II**
**Relational Algebra and Calculus:** Relational Algebra - Selection and Projection, Setperations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus.
**Form of Basic SQL Query** - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

**UNIT-III**
**Introduction to Schema Refinement** - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

## UNIT-IV

**Transaction Management** - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

**Concurrency Control** - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity.

**Recovery System**-Failure Classification-Storage Structure-Recovery and Atomicity - Log - Based Recovery - Recovery with Concurrent Transactions - Buffer Management − Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

## UNIT-V

**Overview of Storage and Indexing**: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures − Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

**Tree Structured Indexing**: Intuitions for tree indexes, Indexed Sequential Access Methods (ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, and Delete.

**Hash Based Indexing**: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

## TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VIedition, 2006.

## REFERENCES:

1. Database Systems, 6th edition, RamezElmasri, Shamkat B. Navathe, Pearson Education, 2013.
2. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Introduction to Database Systems, C.J. Date, Pearson Education.
4. Database Management Systems, G.K. Gupta, McGrawHill Education
5. Introduction to Programming with Java, J.Dean&R.Dean, McGraw Hill education.

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**(Open Elective)**
**(16MB752) Intellectual Property Rights**

**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 trademarks, 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 screte litigation.
**Unfair competition:** Misappropriation right of publicity, False advertising.

**UNIT - V:**
**New development 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, and international development in trade secrets law.

**TEXT BOOKS & REFERENCES:**
1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddhaganguli, Tata Mc Graw Hill Publishing Company Ltd.

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### (16CE138) Environmental Engineering Lab

*Course objectives:*
- *The laboratory provides knowledge of estimating various parameters like PH, Chlorides, Sulphate, and 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.*

*Course outcomes:*
*After successful completion of this laboratory course the student is in a position to:*
- *Perform common environmental experiments relating to water and wastewater quality, and know which tests are appropriate for given environmental problems.*
- *Apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions.*
- *Understand and use the water and wastewater sampling procedures and sample preservations.*
- *Obtain the necessary background for subsequent courses in environmental engineering.*

**LIST OF EXPERIMENTS:**
1. Determination of pH.
2. Determination of Conductivity.
3. Determination of Acidity of water.
4. Determination of Alkalinity of Water.
5. Determination of Chlorides.
6. Determination of Hardness of water.
7. Determination of Residual Chlorine.
8. Determination of Dissolved Oxygen.
9. Determination of Chemical Oxygen Demand.
10. Determination of Biochemical Oxygen Demand.
11. Conducting Jar test for determining optimum dosage of coagulant.
12. Determination of Total Solids, Total Dissolved Solids &Settelable Solids.

**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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## (16CE139) Computer Aided Design Lab

*Course Objectives:*
- *To provide software skills regarding analysis and design.*
- *To provide knowledge to analyze and design frames, trusses and slabs.*
- *To understand the analysis and design of communication tower and retaining wall.*
- *To provide skills to analyze and design any practical building plan.*

*Course Outcomes:*
*After completion of the course the Students will be able to*
- *To acquire the skills in using software.*
- *To analyze and design reinforced concrete structures like frames, slabs and columns.*
- *To analyze and design steel structures like trusses and communication towers etc.*
- *To analyze and design any given building plan.*

**SOFTWARE:**
1. STAAD PRO or Equivalent

**EXCERCISES:**
1. 2-D Frame Analysis and Design
2. 3-D Frame Analysis and Design
3. Steel Tabular Truss Analysis and Design
4. Retaining Wall Analysis and Design
5. One Way Slab Analysis & Design
6. Two Way Slab Analysis & Design
7. Column Analysis & Design
8. Design of Overhead Tank
9. Analysis of Multistoried Building
10. Design of Multistoried Building

**TEXT BOOKS:**
1. *Computer Aided Design Lab Manual* by Sesha Prakash, M.N. and C.S. Suresh.

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**(16CE140) Design and Drawing of Irrigation Structures**

*Course objectives:*
- *To impart knowledge of hydraulic design of irrigation structures and their drawing*

*Course outcomes:*
- *After completion of the course the student is in position of perform hydraulic design and drawing of irrigation structures.*

**UNIT I**
Design and drawing of Sloping Glacis Weir

**UNIT II**
Design and drawing of Surplus Weir

**UNIT III**
Design and drawing of Tank Sluice with Tower Head

**UNIT IV**
Design and drawing of Type III Syphon Aqueduct

**UNIT V**
Design and drawing of Canal Regulator

**FINAL EXAMINATION PATTERN:** Any *Two* questions of the above *Five* designs may be asked out of which the student has to answer *One* question. The duration of examination is three hours.

**TEXT BOOKS:**
1. *Design of minor irrigation and canal structures* by C. Satyanarayana Murthy, Wiley eastern Ltd.
2. *Irrigation engineering and Hydraulic structures* by S.K. Garg, Standard Book House.

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**(Department Elective – II)**
**(16CE141) Advanced Foundation Engineering**

*Course objectives:*

- *To impart knowledge on common method of sub soil investigation and design of foundation. At the end of this course student acquires the capacity to investigate the soil condition and to select and design a suitable foundation.*

*Course outcomes:*

- *Students will have the ability to select type of foundation required for the soil at a place and able to design shallow, foundation, deep foundation and retaining structures.*

**UNIT I**
**SHALLOW FOUNDATIONS-I:** General requirements of foundation- Types of shallow foundations and the factors governing the selection of type of shallow foundation-Bearing capacity of shallow foundations by Terzaghi's theory and Meyerhof's theory (derivation of expressions and solution to problems based on these theories). Local shear and general shear failure and their identification

**UNIT II**
**SHALLOW FOUNDATIONS-II**: Bearing capacity of isolated footing subjected to eccentric and inclined loads- Bearing capacity of isolated footing resting on stratified soils- Button's theory - Analysis and structural design of R.C.C isolated- combined and strap footings.

**UNIT III**
**DEEPFOUNDATIONS:** Pile foundations-types of pile foundations. Estimation of bearing capacity of pile foundation by Dynamic and static formulae- Bearing capacity and settlement analysis of pile groups. Negative skin Friction, Pile load tests. Well foundations – elements of well foundation. Forces acting a on a well foundation. Depth and bearing capacity of well foundation-Design of individual components of well foundation (only forces acting and principles of design).

**UNIT IV**
**SHEET PILE WALLS:** Cantilever sheet piles and anchored bulkheads- Earth Pressure diagram-Determination of depth of embedment in sands and clays-Timbering of Trenches – Earth Pressure Diagrams – Forces in struts.
**DESIGN OF UNDER REAMED PILES FOUNDATIONS:** Under reamed piles-principle of functioning of under reamed pile-Analysis and structural design of under reamed pile.
**UNIT V**
**FOUNDATIONS IN PROBLEMATIC SOILS:** Foundations in black cotton soils- basic foundation problems associated with black cotton soils. Lime column techniques – Principles and execution-Use of Cohesive Non-Swelling (CNS) layer below shallow foundations.

**TEXT BOOKS:**
1. *Analysis and Design of Foundations and Retaining Structures* by Shamsher Prakash, Gopal Ranjan and Swami Saran, 2nd Edition, Meerut, Sarita Prakash
2. *Soil Mechanics and Foundation Engineering* by Purushtoma Raj, 4th Edition, Pearson India

**REFERENCES:**
1. *Geotechnical Engineering* by Venkatramaiah, 3rd Edition, New age international
2. *Foundation engineering* by Brije.M. Das, 7th Edition, Cengage publications, New Delhi.

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**(Department Elective – II)**
**(16CE142) Advanced Structural Design**

*Course Objectives:*
- *To study the design aspects of critical structures like Flat slabs, Water Tanks, Retaining Walls, Plate Girders, Gantry Girders.*
- *To understand the conceptual behavior of prestressing methods and systems of prestressing*

*Course Outcomes:*
*Students undergoing this course are,*
- *Able to design the advanced structures like Flat slabs, Water tanks, Retaining walls, Plate Girders, Gantry Girders.*
- *Able to analyse the prestressed Structures*

**UNIT – 1**
**FLAT SLAB:** Direct Design Method – Distribution of Moments in Column Strips and Middle Strip - Moment and Shear Transfer from Slabs to Columns – Shear in Flat Slabs - Check for One Way and Two - Way Shears

**UNIT – 1I**
**WATER TANKS:** Design of Circular Water Tanks with Flexible & Rigid Bases Resting on Ground – Design of Rectangular Water Tanks Resting on Ground

**UNIT – III**
**RETAINING WALLS:** Introduction – Types of Retaining Walls – Stability of Retaining Walls – Design of Retaining Walls – Cantilever and Counter fort Types for Different Loadings

**UNIT – IV**
**PLATE GIRDERS:** Design of Plate Girders - Design of Section for Flexure, Shear and Deflection - Connections - Horizontal and Vertical Stiffeners - Curtailment of Flange Plates - Design of Bearing Stiffener, Web Splices - Plate girder

**UNIT – V**
**DESIGN OF GANTRY GIRDER:**
Introduction-Loading consideration and maximum load effect-Selection of gantry girder-Design of gantry girder for primary loads only.

**TEXT BOOKS:**
1. *Limit state design of steel structures* by SK Duggal 1st Edition, Tata McGraw Hill publications.
2. *Structural Design and drawing (RCC and steel)* by Krishnam Raju, Universities. Press, New Delhi
3. *Prestressed Concrete* by N Krishna Raju, 5 editions, Tata McGraw Hill publications.

**REFERENCES*:*

1.  *R.C.C Structures* by  Dr. B. C. Punmia, Ashok Kumar Jain,  Arun Kumar Jain, Laxmi Publications, New Delhi
2.  *Fundamentals of RCC* by N.C. Sinha and S.K. Roy, S. Chand Publications, New Delhi.
3.  *Advanced RCC* by Varghese, PHI Publications, New Delhi.
4.  *Design of RCC structures* by M.L. Gambhir P.H.I. Publications, New Delhi.

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### (Department Elective – II)
### (16CE143) Water Resources Systems Planning & Management

*Course objectives:*
- *To introduce the student to the concept of Mathematical approaches for managing the water resources system.*
- *To make the students apply an appropriate system approach to optimally operate a water resource system*

*Course outcomes:*
- *The students will be exposed to the economic aspects and analysis of water resources systems by which they will get an idea of comprehensive and integrated planning of a water resources project.*
- *The students will develop skills in solving problems in operations research through LP, DP and Simulation techniques*

## UNIT – I
**INTRODUCTION:** concepts of systems analysis- definition- systems approach to water resources planning and management- role of optimization models- objective function and constraints- types of optimization techniques.

## UNIT – II
**LINEAR PROGRAMMING –I:** Formulation linear programming models-graphical method- simplex method- application of linear programming in water resources.
**LINEAR PROGRAMMING – II:** Revised simplex method-duality in linear programming-sensitivity and post optimality analysis**.**

## UNIT – III
**DYNAMIC PROGRAMMING:** Belman's of principles of optimality forward and backward recursive dynamic programming case of dimensionality-application of dynamic programming for resource allocation.
**NON-LINEAR OPTIMATIZATION TECHNIQUES:** Classical method optimization- Kun-Tecker-gradient based research techniques for simple unconstrained optimization.

## UNIT – VI
**SIMULATION:** application of simulation techniques in water resources**.**
**WATER –RESOURCES ECONOMICS:** Principles of Economics analysis-benefit cost analysis -socio economic intuitional and pricing of water resources.

## UNIT – V
**WATER RESOURCES MANAGEMENT:** Planning of reservoir system-optimal operation of single reservoir system- allocation of water resources- optimal cropping pattern-and conjunctive use of surface and sub- surface water resources.

**TEXT BOOKS:**
1. *Water Resources System Analysis* by Vedula & Mujumdar, Tata McGraw Hill Company Ltd.
2. *Water Resources Economics* by James & Lee. Oxford Publishers.
3. *Optimization technique* by S.S. Rao-New Age International publishers.

**REFERENCES:**
1. Op*timal design of water distribution networks* by P.R. Bhave, Narosa Publishing house.
2. *Operations research* by P. Sankar Iyer, TMH Publications, New Delhi.
3. *Operations research* by N. Ramanathan, TMH Publications, New Delhi.

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**(Department Elective – III)**
**(16CE144) Construction Technology and Project Management**

*Course Objectives:*
- *To Implement CPM and PERT concepts in construction*
- *To provide techniques to develop personal skills of practical use in the Management and implementation of Civil Engineering projects*
- *To know the Management techniques, the development of personal, interpersonal and Project Management skills*
- *To provide a fundamental of understanding of the social, economic, resource management within which the Construction Project takes place.*

*Course Outcomes:*
*After completion of this course, the student shall be able to*
- *Implement generic and special Construction Project Management skills to a higher level*
- *Understand the special management skills required in multidisciplinary and global Construction Industry*
- *Integrate and apply theoretical concepts, ideas, tools and techniques to Construction practice.*
- *Can plan, execute, monitor and control construction projects using Construction Project Management Tools such as CPM & PERT*

**UNIT-I**
**FUNDAMENTALS OF CONSTRUCTION TECHNOLOGY:** Definitions and Discussion – Construction Activities – Construction Processes - Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Construction Documents – Construction Records – Quality – Safety – Codes and Regulations.
**PREPARATORY WORK AND IMPLEMENTATION:** Site layout – Infrastructure Development – Construction Methods – Construction Materials – Deployment of Construction Equipment – Prefabrication in Construction – False work and Temporary Works

**UNIT- II**
**EARTH WORK:** Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging. Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drillability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting
**UNIT-III**
**PROJECT MANAGEMENT AND BAR CHARTS AND MILESTONE CHARTS:**
Introduction – Project planning – Scheduling – Controlling – Role of decision in project management – Techniques for analyzing alternatives Operation research – Methods of planning and programming problems – Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts – Development of PERT network problems

## UNIT- IV

**ELEMENTS OF NETWORK AND DEVELOPMENT OF NETWORK:** Introduction – Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles Problems – Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure –Hierarchies – Illustrative examples – Problems

## UNIT-V

**PERT:** Uncertainties: Use of PERT – Time estimates – Frequency distribution – Mean, variance and standard deviation – Probability distribution – Beta distribution – Expected time Problems -Earliest expected time – Formulation for $T_E$ - Latest allowable occurrence time – Formulation for $T_L$ - Combined tabular computations for $T_E$ and $T_L$ problems.

**CPM:** Slack – Critical path – Illustrative examples – Probability of meeting scheduled date Problems – CPM: process – CPM: Networks – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for $T_E$ and $T_L$ - Start and finish times        of activity – Float – Critical activities and critical path – Illustrative examples Problems.

## TEXT BOOKS:

1. *Construction Technology* by Subir K. Sarkar and Subhajit Saraswati, Oxford Higher Education- Publishing, Univ. Press, Delhi.
2. *Project Planning and Control with PERT and CPM* by Dr.B.C. Punmia, K.K. Khandelwal, Lakshmi Publications New Delhi.

## REFERENCES:

1. *Optimal design of water distribution networks* by P.R. Bhave, Narosa Publishing house 2003.
2. *Total Project management, the Indian context* by: P.K.JOY, Mac Millan Publishers India Limited.
3. *Construction project management* by Jha, Pearson publications, New Delhi.

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**(Department Elective – III)**
**(16CE146) Ground Improvement Techniques**

*Course Objectives:*
- *To give an overview of latest ground improvement techniques*
- *To understand the problems related to soil and select the best method*

*Course Outcomes:*
*After completion of this course, the student shall be able to*
- *Identify the problems in Expansive soils*
- *Implement the stabilization methods*
- *Apply grouting and dewatering techniques*

**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. *Ground Improvement Techniques* by Dr.P. Purushotham Raj, Laxmi Publications, New Delhi.
2. *Ground Improvement Techniques* by Nihar Ranajan Patra, Vikas Publications, New Delhi

**REFERENCES:**
1. *Ground Improvement* by Moseley M.P, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. *Engineering Principles of Ground Modification* by Haussmann M.R, McGraw-Hill International Edition.

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**(Department Elective – III)**
**(16CE147) Prestressed Concrete**

*Course objectives*
*The objective of this course is:*
- *Familiarize Students with concepts of prestressing.*
- *Equip student with different systems and devices used in prestressing.*
- *Understand the different losses of prestress including short and long-term losses.*
- *Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion.*

*Course Outcomes*
*At the end of this course the student will be able to*
- *Understand the different methods of prestressing.*
- *Estimate the effective prestress including the short and long term losses.*
- *Analyze and design prestressed concrete beams under flexure and shear.*
- *Understand the relevant IS Codal provisions for prestressed concrete*

**UNITI**
**Introduction**: Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing Materials- high strength concrete and high tensile steel their characteristics. Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, MagnelBlaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

**UNIT II**
**Losses of Pre-stressing**– Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design.

**UNITIII**
**Design for Flexural resistance**– Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing- Prediction of short term and long-term deflections.

**UNIT IV**
**Design for Shear and Torsion**– Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

**UNITV**
**Transfer of Prestress in pre-tensioned members**– Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

**TEXT BOOKS**
1. *Prestressed concrete* by N. Krishna Raju, 51h Edition, Tata McGraw Hill Book Education Pvt. Ltd.

**REFERENCES**
1. *Design of prestress concrete structures* by T.Y. Lin and Burn, John Wiley, New York1
2. *Prestressed concrete* by S. Raniarnrutham, Dhanpat Rai & Sons, Delhi.
3. *Prestressed Concrete* by N. Rajagopalan, Narosa Publishing House.

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**Elective – IV**
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**(16CE148) SEMINAR**

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**(16CE149) PROJECT WORK**

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