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| **VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY** |
| **DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING** |
| **CO-PO-PSO GRAND MATRIX** |
| By the end of the each course student will be able to  |
| **1-1** |
| **C111** | **COMMUNICATIVE ENGLISH** | **CO1** | Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and formulate sentences using proper grammatical structures and correct word forms **(L3)** |
| **CO2** | Speak clearly on a specific topic using suitable discourse markers in informal discussions **(L3)** |
| **CO3** | Write summaries based on global comprehension of reading/listening texts **(L3)** |
| **CO4** | Produce a coherent paragraph interpreting a figure/graph/chart/table **(L4)** |
| **CO5** | Take notes while listening to a talk/lecture to answer questions **(L3)** |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO2** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO3** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO4** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO5** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
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| **C112** | **MATHEMATICS-I****MATHEMATICS-I** | **CO1** | Solve the differential equations related to various engineering fields.(L3) |
| **CO2** | Utilize mean value theorems to real life problems.(L2) |
| **CO3** | Familiarize with functions of several variables which is useful in optimization.(L1) |
| **CO4** | Apply double integration techniques in evaluating areas bounded by region.(L3) |
| **CO5** | Learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3 – dimensional coordinate systems.(L1) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
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| **C113** | **APPLIED PHYSICS****MATHEMATICS-I** | **CO1** | **Understand** the principles such as interference and diffraction to design and enhance the resolving power of various optical instruments(L2) |
| **CO2** | **Learn** the basic concepts of LASER light Sources and Apply them to holography(L3) |
| **CO3** | **Study** the magnetic and dielectric materials to enhance the utility aspects of materials(L2) |
| **CO4** | **Learn** the fundamental concepts of Quantum behaviour of matter.(L3) |
| **CO5** | **Identify** the type of semiconductors using Hall Effect.(L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
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| **VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY** |
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| **CO-PO-PSO GRAND MATRIX** |
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| **C114** | **PROBLEM SOLVING USING C** | **CO1** | **Understand** algorithms and basic terminology of C(L2) |
| **CO2** | **Solve** problems using control structures and modular approach(L3) |
| **CO3** | **Make** use of 1D and 2D arrays along with strings for linear data handling(L2) |
| **CO4** | **Determine** the use of pointers and structures (L3) |
| **CO5** | **Implement** various operations on data files.(L3) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 1 | 2 | 3 | 2 | 1 | - | - | - | 3 | 3 | 1 | 2 | 1 | 2 |
| **CO2** | 2 | 3 | 3 | 2 | - | - | - | - | 1 | 1 | 2 | 2 | 2 | 2 |
| **CO3** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | 1 | 2 | 2 | 2 | 3 |
| **CO4** | 2 | 2 | 2 | 2 | - | - | - | - | 2 | 1 | 2 | 2 | 2 | 2 |
| **CO5** | 2 | 2 | 2 | 2 | - | - | - | - | 2 | 1 | 2 | 2 | 1 | 2 |
|  |
| **C115** | **ENGINEERING GRAPHICS**  | **CO1** | Prepare engineering drawings as per BIS conventions (L2) |
| **CO2** | Produce computer generated of orthographic projections of Lines and Plane surfaces using CAD software(L3) |
| **CO3** | Use the knowledge of orthographic projections of Solids to represent engineering information/concepts and present the same in the form of drawings (L3) |
| **CO4** | Use the knowledge of sectional views and Development of Solid Surfaces in Real time Applications(L3) |
| **CO5** | Develop isometric drawings of simple objects reading the orthographic projections of those objects (L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 1 | 1 | – | 3 | – | – | – | – | 2 | – | 1 | – | 1 |
| **CO2** | 2 | 1 | 1 | – | 3 | – | – | – | – | 2 | – | 1 | – | 1 |
| **CO3** | 2 | 2 | 2 | – | 3 | – | – | – | – | 2 | – | 1 | – | 1 |
| **CO4** | 2 | 2 | 2 | – | 3 | – | – | – | – | 2 | – | 1 | – | 1 |
| **CO5** | 2 | 2 | 2 | – | 3 | – | – | – | – | 2 | – | 1 | – | 1 |
|  |
| **C116** | **COMMUNICATIVE ENGLISH LAB**  | **CO1** | Prioritize information from reading texts after selecting relevant and useful points and paraphrase short academic texts using suitable strategies and conventions (L3) |
| **CO2** | Make formal structured presentations on academic topics using PPT slides with relevant graphical elements (L3) |
| **CO3** | Participate in group discussions using appropriate conventions and language strategies (L3) |
| **CO4** | Prepare a CV with a cover letter to seek internship/ job (L2) |
| **CO5** | Collaborate with a partner to make presentations and Project Reports (L2) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO2** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO3** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO4** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **CO5** | - | - | - | - | - | - | - | - | 2 | 3 | - | 1 | - | - |
| **VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY** |
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| **CO-PO-PSO GRAND MATRIX** |
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| **C117** | **APPLIED PHYSICS LAB** | **CO1** | Operate optical instruments like microscope and spectrometer(L2) |
| **CO2** | Determine thickness of a paper with the concept of interference (L2) |
| **CO3** | Estimate the wavelength of different colours using diffraction grating and resolving power(L3) |
| **CO4** | Plot the intensity of the magnetic field of circular coil carrying current with distance(L1) |
| **CO5** | Calculate the band gap of a given semiconductor(L1) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
|  |
| **C118** | **PROBLEM SOLVING USING C LAB** | **CO1** | **Comprehend** the various concepts of a C language(L2) |
| **CO2** | **Develop** algorithms and flowcharts((L3) |
| **CO3** | **Design** and development of C problem solving skills(L4) |
| **CO4** | **Acquire** modular programming skills.(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 1 | 2 | 3 | 2 | 1 | - | - | - | 3 | 3 | 1 | 2 | 1 | 2 |
| **CO2** | 2 | 3 | 3 | 2 | - | - | - | - | 1 | 1 | 2 | 2 | 2 | 2 |
| **CO3** | 3 | 3 | 3 | 2 | - | - | - | - | 2 | 1 | 2 | 2 | 2 | 3 |
| **CO4** | 2 | 2 | 2 | 2 | - | - | - | - | 2 | 1 | 2 | 2 | 2 | 2 |
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| **CO-PO-PSO GRAND MATRIX** |
| **1-2** |
| **C121** | **MATHEMATICS-II** | **CO1** | Evaluate approximate in the roots of polynomial and transcendental equations by different algorithms (L5) |
| **CO2** | Solve system of linear algebraic equations using Gauss Jacobi, Gauss Seidel and apply Newton’s forward and backward interpolation and Lagrange’s formulae for equal and unequal intervals (L3)) |
| **CO3** | Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations and also by Laplace the transforms for solving differential equations (L3) |
| **CO4** | Find or compute the Fourier series of periodic signals (L4) |
| **CO5** | Know and be able to apply integral expressions for the forwards and inverse Fourier transform to range of non-periodic waveforms (L3) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
|  |
| **C122** | **APPLIED CHEMISTRY** | **CO1** | Explain the preparation, properties and applications of thermoplastics, thermosettings, elastomers and conducting polymers(L2) |
| **CO2** | Know the importance of various materials and their uses in the construction of batteries and fuel cells(L1) |
| **CO3** | Know the applications of advanced materials in various industries(L1) |
| **CO4** | Apply the principles of supramolecular chemistry in the applications of molecular machines, need of green chemistry.(L3) |
| **CO5** | Explain the principles of spectrometry such as UV, IR, and NMR(L2) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | - | - | - | - | 3 | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | - | - | - | - | 2 | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | 2 | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | - | - | - | - | 3 | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | - | - | - | - | 3 | - | - | - | - | - | - | - |
|  |
| **C123** | **BASIC CIRCUIT ANALYSIS** **STUDIES** | **CO1** | Various electrical networks in presence of active and passive elements.(L3) |
| **CO2** | Any R, L, C network with sinusoidal excitation.(**L4)** |
| **CO3** | Any R, L, C network with variation of any one of the parameters i.e R, L, C. and f.(**L4)** |
| **CO4** | Electrical networks by using principles of network theorems.(**L3)** |
| **CO5** | Any magnetic circuit with various dot conventions.(**L3)** |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | - |
| **CO2** | 3 | 2 | 2 | 1 | - | 1 | - | - | - | - | - | 1 | 2 | 2 |
| **CO3** | 3 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | 2 | 2 |
| **CO4** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 |
| **CO5** | 2 | 2 | 2 | 1 | - | 1 | - | - | - | - | - | 1 | 1 | - |
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| **C124** | **BASICELECTRONIC DEVICES &CIRCUITS** | **CO1** | Develop through basic knowledge on the behaviour and the characteristics of semiconductor junction. (L2) |
| **CO2** | Demonstrate the usage of diodes in various applications **(L3)** |
| **CO3** | Acquire knowledge on the operations of BJT, FET, and MOSFET. **(L2)** |
| **CO4** | Learn the art of biasing of BJTs and FETs, small signal low frequency models of BJTs and FETS in amplifier analysis **(L4)** |
| **CO5** | Learn the feedback topology of amplifier and applications of transistors **(L4)** |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO2** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO3** | - | 3 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| **CO4** | - | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO5** | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | 2 |
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| **C125** | **PROBLEM SOLVING USING PYTHON** | **CO1** | Develop essential programming skills in computer programming concepts like data types, containers (L2) |
| **CO2** | Solve coding tasks related to conditions, loops and String processing(L3) |
| **CO3** | Experiment with various Data structures in interpreted Language and to build modules and packages for real software needs.(L4) |
| **CO4** | Implement Files and object oriented principles in Python(L4) |
| **CO5** | Identify solutions using GUI in Python.(L2) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 1 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 |
| **CO2** | 1 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 1 |
| **CO3** | 1 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 3 | 2 |
| **CO4** | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 2 |
| **CO5** | 1 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
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| **C126** |  **APPLIED CHEMISTRY LAB** | **CO1** | To estimate the amount of metal ions present in different solutions (L4 ) |
| **CO2** | To analyze the quality parameters of water (L4) |
| **CO3** | To determine the strength of different solutions by using different instrumentation techniques (L3) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 3 | - | - | - | - | - | - | 2 | - | - | - | - | - |
| **CO2** | 2 | 2 | - | - | - | - | - | - | 2 | - | - | - | - | - |
| **CO3** | 2 | 3 | - | - | - | - | - | - | 2 | - | - | - | - | - |
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| **C127** | **BASIC ELECTRONIC DEVICES & CIRCUITS LAB** | **CO1** | Measure voltage, frequency and phase of any waveform using CRO.(L3) |
| **CO2** | Generate sine, square and triangular waveforms with required frequency and amplitude using function generator(L2) |
| **CO3** | Analyze the characteristics of different electronic devices such as diodes etc.(L4) |
| **CO4** | Analyze the characteristics of different electronic devices such as transistors etc.(L4) |
| **CO5** | Analyze and design simple circuits like rectifiers, power supplies and amplifiers etc.,(L4) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO4** | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| **CO5** | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 |
|  |
| **C128** | **PROBLEM SOLVING USING PYTHON LAB**  | **CO1** | Comprehend how software easily to build right out of the box.(L2) |
| **CO2** | Demonstrates the use of an interpreted language for problem solving through control statements including loops and conditionals.(L3) |
| **CO3** | Practice with data structures for quick programming solutions(L4) |
| **CO4** | Demonstrates software building for real needs by breaking out code into reusable functions and modules.(L3) |
| **CO5** | Comprehend the software reliability through exception handling.(L2) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | - | 3 | 2 | 2 | - | - | - | 2 | - | - | - | - | - |
| **CO2** | 2 | 2 | 2 | 2 | 2 | - | - | - | 2 | - | - | - | - | - |
| **CO3** | 2 | 2 | 2 | 2 | 3 | - | - | - | 2 | - | - | - | - | - |
| **CO4** | 2 | 1 | 2 | 2 | 2 | - | - | - | 3 | 2 | - | - | - | - |
| **CO5** | - | 3 | 3 | 2 | 3 | - | - | - | 3 | 2 | - | - | - | - |
|  |
| **C129** | **CONSTITUTIONOF INDIAN**  | **CO1** | Know the sources, features and principles of Indian Constitution.(L2) |
| **CO2** | Learn about Union Government, State government and its administration.(L1) |
| **CO3** | Get acquainted with Local administration and Pachayati Raj.(L2) |
| **CO4** | Be aware of basic concepts and developments of Human Rights.(L2) |
| **CO5** | Gain knowledge on roles and functioning of Election Commission(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | - | 3 | - | - | 3 | - | 2 | 3 | - | 3 | 2 | 2 | 2 |
| **CO2** | 2 | - | 2 | - | - | 2 | - | 2 | 2 | - | 3 | 2 | 2 | 2 |
| **CO3** | 3 | - | 3 | - | - | 2 | - | 2 | 2 | - | 3 | 3 | 2 | 2 |
| **CO4** | 2 | - | 3 | - | - | 2 | - | 2 | 2 | - | 3 | 3 | 2 | 2 |
| **CO5** | 3 | - | 1 | - | - | 3 | - | 3 | 3 | - | 3 | 2 | 2 | 2 |
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| **CO-PO-PSO GRAND MATRIX** |
| **2-1** |
| **C211** | **MATHEMATICS-III** | **CO1** | Analyze the solution of the system of linear equations and to find the Eigenvalues and Eigen vectors of a matrix. (L4) |
| **CO2** | Apply Cayley-Hamilton theorem to determine inverse and power of a matrix and identify the nature of the quadratic form (L3) |
| **CO3** | Interpret the physical meaning of different operators such as gradient, curl and divergence. (L5) |
| **CO4** | Determine line, surface and volume integrals. Apply Green’s, Stoke’s and Gauss divergence theorems to calculate line, surface and volume integrals. (L5) |
| **CO5** | Identify the solution methods for partial differential equation that model physical processes. (L3) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
|  |
| **C212** | **DATA STRUCTURES**  | **CO1** | Implement various operations on linear lists. (L2) |
| **CO2** | Apply data structure strategies like stacks and queues for exploring complex data structures. (L3) |
| **CO3** | Identify performance and trade-offs of static and dynamic data structures. (L3) |
| **CO4** | Incorporate data structures into the applications such as binary trees, binary search trees. (L3) |
| **CO5** | Identify appropriate data structure algorithms for graphs. (L3) |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 |
| **CO2** | 1 | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | 1 |
| **CO3** | 1 | - | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 1 |
| **CO4** | 2 | - | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 |
| **CO5** | - | 2 | 1 | 2 | - | - | - | - | - | - | - | - | 1 | 1 |
|  |
| **C213** | **ELECTRICAL MACHINES-1** | **CO1** | Understand the concepts of energy conversion and principle operation of DC Generator. (L2) |
| **CO2** | Examine the significance of Back EMF and Production of Torque in DC Motor. (L3) |
| **CO3** | Analyze the speed control methods and performance of DC Machine. (L4). |
| **CO4** | Quantify the performance of single phase transformers. (L5) |
| **CO5** | Empathies parallel operation of transformers and three-Phase to two- phase Conversion. (L5). |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 1 |
| **CO2** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | - | 1 |
| **CO4** | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | - | 1 |
| **CO5** | 1 | 1 | - | 2 | - | - | - | - | - | - | - | - | - | - |
|  |
| **VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY** |
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| **CO-PO-PSO GRAND MATRIX** |
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| **C214** | **ELECTRICAL CIRCUIT ANALYSIS** | **CO1** | Various three phase balanced and unbalanced systems (L3) |
| **CO2** | Transient response of electrical networks for DC excitation.(L4) |
| **CO3** | Transient response of electrical networks for AC excitations(L4) |
| **CO4** | Two port network parameters (L3) |
| **CO5** | Equivalent electrical network for a given transfer function.(L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | 2 | 1 |
| **CO2** | 1 | 2 | - | - | - | - | - | - | - | - | - | 1 | 2 | 1 |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | - | - | 1 | 2 | 1 |
| **CO4** | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | 2 | 1 |
| **CO5** | 2 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 |
|  |
| **C215** | **ELECTROMAGNETIC FIELDS** | **CO1** | The student will be able to calculate the electric field and potentials using Gauss’s law and Laplace equation (L3) |
| **CO2** | The student will be able to evaluate capacitance for different configurations (L4) |
| **CO3** | The student will be able to find magnetic field intensity of different configurations using Biot-Savart’s law and Ampere’s law (L4) |
| **CO4** | The student will be able to calculate magnetic forces and torque produced by currents in magnetic fields (L4) |
| **CO5** | The student will be able to quantify inductance and evaluation of induced EMF in time varying fields (L6) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | 3 |  | - | - | - | - | - | - | - | - | 3 | - |
| **CO2** | 3 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | 3 | 2 |
| **CO3** | 3 | 2 | 3 | 2 | - | 1 | - | - | - | - | - | 1 | 2 | 3 |
| **CO4** | 2 | 2 | 2 | 2 | 1 | 1 | - | - | - | - | - | 1 | 2 | 2 |
| **CO5** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | 1 |
|  |
| **C216** | **ELECTRICAL MACHINES-1 LAB**  | **CO1** |  Analyze the characteristics and performance of DC generator. (L4) |
| **CO2** | Analyze the speed control and testing methods of DC motors. (L4) |
| **CO3** | Determine the performance of DC machines by direct and indirect loading methods. (L2). |
| **CO4** | Perform various types of tests on transformers for assessing losses. (L5) |
| **CO5** | Three-phase to two phase transformation. (L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 1 |
| **CO2** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - |
| **CO3** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 1 |
| **CO4** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | 1 |
| **CO5** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
|  |
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|  **C217** | **ELECTRICAL CIRCUIT ANALYSIS LAB**  | **CO1** | Familiarity with DC and AC circuit analysis techniques.(L2) |
| **CO2** | Analyze complicated circuits using different network theorems.(L4) |
| **CO3** | Analyse the resonance condition of ac circuits(L4) |
| **CO4** | Determine the self and mutual inductance of coupled coils.(L2) |
| **CO5** | Acquire skills of using MATLAB software for electrical circuit studies.(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | 2 | 2 | - | 2 | 1 | - | - | - | - | 1 | 2 | 2 |
| **CO2** | 2 | 1 | 1 | 1 | - | 2 | 1 | - | - | - | - | 1 | 2 | 1 |
| **CO3** | 2 | 2 | 1 | 1 | - | 1 | 1 | - | - | - | - | 1 | 2 | 2 |
| **CO4** | 2 | 2 | 2 | 1 | - | 2 | 2 | - | - | - | - | 2 | 2 | 2 |
| **CO5** | 2 | 1 | 2 | 1 | - | 1 | 1 | - | - | - | - | 2 | 2 | 1 |
|  |
|  **C218** | **FUNDAMENTALS OF INTERNET OF THINGS** | **CO1** | Explain the emergence and challenges in IoT. (L2) |
| **CO2** | Understand the importance of sensors and actuators.(L3) |
| **CO3** | Understand the design methodologies and application areas of IoT.(L4) |
| **CO4** | Design and develop programs in Raspberry Pi for sensor applications. (L4) |
| **CO5** | Interface and deploy sensors with Arduino (L5) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | - | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO3** | - | - | 2 | - | 3 | - | - | - | - | - | - | - | - | 1 |
| **CO4** | - | - | 2 | - | 3 | - | - | - | - | - | - | - | - | - |
| **CO5** | - | - | 2 | - | 3 | - | - | - | - | - | - | - | - | - |
|  |
|  **C219** | ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE  | **CO1** | Able to Understandtraditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge(L2) |
| **CO2** | Able to UnderstandProtection of traditional knowledge(L2) |
| **CO3** | Able to understand and apply Legal framework and Traditional Knowledge(L2) |
| **CO4** | Able to UnderstandTraditional knowledge and intellectual property(L2) |
| **CO5** | Able to Understand Traditional knowledge in different sectors(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| **CO2** | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| **CO3** | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| **CO4** | - | - | - | - | - | 3 | 3 | 3 | - | - | - | - | - | - |
| **CO5** | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
|  |
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| **CO-PO-PSO GRAND MATRIX** |
| **2-2** |
|  **C221** | **COMPLEX VARIABLES AND STATISTICAL METHODS** | **CO1** | Apply Cauchy-Riemann equations to complex function in order to determine whether a given continuous function is analytic. (L3) |
| **CO2** | Find the differentiation, integration of complex functions used in engineering problems and make use of Cauchy residue theorem to evaluate certain integrals. (L3) |
| **CO3** | Apply discrete and continuous probability distributions and Design the componentsof a classical hypothesis test. (L6) |
| **CO4** | Infer the statistical inferential methods (hypothesis testing) based on small and large sampling tests. (L4) |
| **CO5** | Interpret the association of characteristics and through correlation and regression tools. (L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
|  |
| **C222** | **THERMAL AND HYDRO PRIME MOVERS**  | **CO1** | Explain the fundamental concepts of Thermodynamics and also apply the laws of thermodynamics to cycles, cyclic devices. (L3) |
| **CO2** | Understand about the working of IC engines and gas turbine plants including its performance evaluation. (L3) |
| **CO3** | Analyze the energy transfers and transformations while steam is flowing through the blades of steam turbine.(L4) |
| **CO4** | Understand about fluid properties and also apply the Bernoulli’s theorem for flowing fluids.(L3) |
| **CO5** | Compute the performance of hydraulic turbines and also understand working of the hydraulic pumps. (L3)  |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 1 | - | - | 2 | - | - | - | - | - | 1 | 2 | 2 |
| **CO2** | 3 | 3 | 1 | - | - | 2 | 1 | - | - | - | - | 1 | 2 | 2 |
| **CO3** | 3 | 3 | 1 | - | - | 2 | - | - | - | - | - | 1 | 2 | 2 |
| **CO4** | 3 | 3 | 1 | - | - | 2 | - | - | - | - | - | 1 | 2 | 2 |
| **CO5** | 3 | 3 | 1 | - | - | 2 | - | - | - | - | - | 1 | 2 | 2 |
|  |
| **C223** | **POWER SYSTEMS-1** | **CO1** | Understand the working of hydro and thermal power plants. (L2) |
| **CO2** | Explain the working of nuclear, gas, diesel power plants and non-conventional energy sources.(L3) |
| **CO3** | Analyze transmission lines parameters (L4) |
| **CO4** | Evaluate the performance of AC and DC distribution systems. (L5) |
| **CO5** | Analyze the different load curves and tariff methods. (L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | - | - | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO3** | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | 1 |
| **CO5** | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 |
|  |
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| **C224** | **ELECTRICAL MACHINES-II**  | **CO1** | Explain the operation and performance of three phase induction motor.(L1) |
| **CO2** | Analyze the torque-speed relation, starting and speed control of induction motor.(L4) |
| **CO3** | Describe the torque production and starting methods of single-Phase induction motor.(L1) |
| **CO4** | Empathies the Principle, Voltage Regulation and Parallel operation of synchronous generator. (L2)  |
| **CO5** | Realize the operation, performance and starting methods of synchronous motor.(L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | - | - | 1 | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO2** | 2 | 3 | - | - | 1 | - | - | - | - | - | - | - | 2 | - |
| **CO3** | 3 | 1 | - | - | 1 | - | - | - | - | - | - | 1 | 1 | 2 |
| **CO4** | 2 | 3 | - | - |  | - | - | - | - | - | - | - | 2 | 1 |
| **CO5** | 2 | 1 | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
|  |
| **C225** | **CONTROL SYSTEMS**  | **CO1** | Derivethetransferfunctionusingblockdiagramalgebraandsignalflowgraph (L2) |
| **CO2** | DeterminetimeresponsespecificationsofsecondordersystemsandErrorconstants (L2) |
| **CO3** | AnalyzestabilityusingRouth’sstabilitycriterionandtherootlocusmethod (L4) |
| **CO4** | Analyze the stability using Bode plot and Nyquist criterion (L4) |
| **CO5** | Obtain the state models and understanding the concepts of controllability and observability (L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | 3 |  | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | 1 | - | - |
| **CO3** | 3 | 2 | 3 | 2 | - | 1 | - | - | - | - | - | 1 | - | - |
| **CO4** | 2 | 2 | 2 | 2 | 1 | 1 | - | - | - | - | - | 1 | - | 1 |
| **CO5** | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 |
|  |  |  |  |  | - |
|  **C226** | **THERMAL AND HYDRO PRIME MOVERS LAB** | **CO1** | Compute the performance of the IC Engines for a given conditions and also draw the valve and port timing diagrams(L3) |
| **CO2** | Determine the frictional power by using the Morse test, retardation test and motoring test.(L3) |
| **CO3** | Calibrate discharge measuring devices and finding discharge through the venture meter and the orifice meter.(L3) |
| **CO4** | Analyze the performance of hydraulic machines(L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | - | 2 | - | 2 | - | - | 3 | - | - | - | 2 | 1 |
| **CO2** | 3 | 3 | - | 2 | - | 2 | - | - | 3 | - | - | - | 2 | 1 |
| **CO3** | 3 | 3 | - | 2 | - | 2 | - | - | 3 | - | - | - | 2 | 1 |
| **CO4** | 3 | 3 | - | 2 | - | 2 | - | - | 3 | - | - | - | 2 | 1 |
|  |
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| **C227** | **ELECTRICAL MACHINES-II LAB**  | **CO1** | Able to assess the performance of three phase induction motor. (L4) |
| **CO2** | Able to control the speed of three phase induction motor. (L2) |
| **CO3** | Able to assess the performance of single phase induction motor. (L4) |
| **CO4** | Able to predetermine the regulation of three–phase alternator by various methods. (L5) |
| **CO5** | Able to find the Xd / Xq ratio of alternator and asses the performance of three–phase synchronous motor. (L4). |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO2** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 1 | - | 1 | - | - | - | - | - | - | - | 1 | 1 | 2 |
| **CO4** | 2 | 3 | - | 1 | - | - | - | - | - | - | - | 1 | 2 | 2 |
| **CO5** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | - |
|  |
| **C228** | **CONTROL SYSTEMS LAB** | **CO1** | Able to analyze the time response of a second order system(L4) |
| **CO2** | Able to analyze the effect of P, PI,PD, PID controllers and Lag, Lead compensators(L4) |
| **CO3** | Able to judge the stability in time and frequency domain(L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 1 | - | 1 | 1 | - | - | - | - | - | - | 1 | 2 | 1 |
| **CO2** | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | 1 | 1 | 1 | 1 |
| **CO3** | 1 | - | - | - | 1 | - | - | - | - | - | - | 1 | 2 | 1 |
|  |
| **C229** | **FUNDAMENTS OF MATLAB AND PSPICE**  | **CO1** | Infer various logical operations. (L3) |
| **CO2** | Recite different matrix and vector operations.(L5) |
| **CO3** | Draw the graphs for analysis of data.(L4) |
| **CO4** | Model circuit elements by distinguishing them AC and DC. (L3) |
| **CO5** | Simulate the given circuit and validate by conventional means. (L4) |
|  |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| **CO1** | - | - | - | - | 1 | - | - | - | - | - | 2 | - | - | - |
| **CO2** | - | - | - | - | 3 | - | - | - | - | - | 2 | - | - | 1 |
| **CO3** | - | - | - | - | 3 | - | - | - | - | - | 2 | - | - | 1 |
| **CO4** | - | - | - | 1 | - | - | - | - | - | - | 2 | - | - | - |
| **CO5** | - | - | - | 1 | - | - | - | - | - | - | 2 | - | - | - |
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| **C2210** | **ENVIRONMENTAL STUDIES** | **CO1** | Able to Understand Natural resources and their importance(L2) |
| **CO2** | Able to UnderstandTheThe concepts of the ecosystem, learn biodiversity of India and the threats to biodiversity and Apply conservation practices(L2) |
| **CO3** | Able to learn Various attributes of the pollution and their impacts.(L1) |
| **CO4** | Able to Understand Social issues both rural and urban environment and Environmental Legislation.(L2) |
| **CO5** | Able to Understand Popultion Explosion and Apply Structure and Functions of Ecosystem.(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** |  |  |  |  | 2 | - | 3 |  | 3 | - |  |  |  |  |
| **CO2** |  |  |  |  | 2 | - | 3 |  | 2 | - |  |  |  |  |
| **CO3** |  |  |  |  | 2 | - | 3 |  | 2 | - |  |  |  |  |
| **CO4** |  |  |  |  | 2 | 3 | 3 | 3 | 2 | - |  |  |  |  |
| **CO5** |  |  |  |  | 3 | - | 3 |  | 3 | - |  |  |  |  |
| **3-1** |
| **C311** | **ENGINEERING ECONOMICS AND MANAGEMENT**  | **CO1** | The Learner is equipped with the knowledge of estimating the Demand and demand elasticity’s for a product and Input-Output-Cost relationships. (L2) |
| **CO2** | The Learner is also ready to understand the nature of different markets and also to have the knowledge of Money & Banking.(L2) |
| **CO3** | The Learner will acquire the knowledge on management, HRM and Marketing. (L3) |
| **CO4** | The Learner will acquire the knowledge to prepare Financial Statements and the techniques of project management.(L2) |
| **CO5** | The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making. (L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 1 | 1 | - | - | - | - | 1 | - | 1 | 1 | 2 | - | 2 | - |
| **CO2** | 1 | 2 | - | - | - | 1 | 1 | - | 1 | - | 2 | - | 1 | 2 |
| **CO3** | - | - | - | - | - | 1 | 1 | 1 | 1 | 1 | 2 | - | - | - |
| **CO4** | 1 | 2 | - | 3 | - | - | 1 | - | 1 | 2 | 2 | - | - | 1 |
| **CO5** | 3 | 1 | - | - | - | - | - | - | - | - | - | - | 2 | 1 |
|  |
| **C312** | **POWER SYSTEMS-II**  | **CO1** | Understand about the performance of various transmission systems(L2) |
| **CO2** | Understandabout Travelling waves and transients in power transmission systems (L2) |
| **CO3** | Analyze various factors related to charged transmission lines (L4) |
| **CO4** | Understandsag/tension of transmission lines and performance of line insulators(L2) |
| **CO5** | Analyze about calculation of Ybus and Zbus matrices (L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | - | - | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO3** | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | 1 |
| **CO5** | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 |
|  |
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|  |
| **C313** | **ELECTRICAL MEASUREMENTS & INSTRUMENTATION**  | **CO1** | Choose suitable instrument for measurement of ac and dc Electrical quantities. (L2) |
| **CO2** | Understand the concepts used in measurement of power, power factor, and frequency & know the application of synchroscope and sequence indicators. (L2) |
| **CO3** | Select suitable bridge for measurement of electrical parameters.(L3) |
| **CO4** | Acquire proper knowledge to use various types of Transducers and able to measure various non-electric quantities. (L3) |
| **CO5** | Acquire proper knowledge and working principle of various types of digital instruments. (L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | 3 |
| **CO2** | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | 3 | 3 |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 3 | 2 |
| **CO4** | 2 | - | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 |
| **CO5** | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
|  |
| **C314** | **POWER ELECTRONICS**  | **CO1** | Design firing circuits for SCR. (L4) |
| **CO2** | Evaluate the performance of converters and can suggest the converter required for DC drives. (L5) |
| **CO3** | Analyze the source current harmonics. (L4) |
| **CO4** | Understand the operation of different types of DC-DC converters(L2) |
| **CO5** | Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation. (L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 |  | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO3** | 3 | - | 2 | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | 1 |
| **CO5** | 3 | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
|  |
| **C315** | **OBJECT ORIENTED PROGRAMMING THROUGH JAVA** | **CO1** | Comprehend object-oriented programming concepts for problem solving.(L2) |
| **CO2** | Build class hierarchy and packages for real world problems.(L3) |
| **CO3** | Develop thread safe Java programs with appropriate Exception handling.(L4) |
| **CO4** | Demonstrate multithreaded application programs through a language(L2) |
| **CO5** | Design GUI applications using swings and multithreading.(L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | - | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | - | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO4** | - | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO5** | - | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - |
|  |
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| **C316** | **ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB** | **CO1** | Able to choose right type of instrument for measurement of voltage and current for ac and dc. (L4) |
| **CO2** | Able to choose right type of instrument for measurement of power and energy – able to calibrate energy meter by suitable method(L2) |
| **CO3** | Able to calibrate ammeter, voltmeter and potentiometer. (L4) |
| **CO4** | Able to select suitable bridge for measurement of electrical parameters. (L5) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |
| **C317** | **POWER ELECTRONICS**  **LAB** | **CO1** | Study the characteristics of various power electronic devices and analyze gate drive circuits of IGBT. (L4) |
| **CO2** | Analyze the performance of single phase and three phase full wave bridge converters with both resistive and inductive loads. (L2) |
| **CO3** | Understand the operation of single phase AC voltage regulator with resistive and inductive loads.(L4) |
| **CO4** |  Understand the working of Buck converter, Boost converter, single phase square wave inverter and PWM inverter.(L5) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | - | - | - | - | - | - | - | 2 | - | - | - | 1 | - |
| **CO2** | 2 | - | - | - | - | - | - | - | 2 | - | - | - | 1 | - |
| **CO3** | 3 | - | - | - | - | - | - | - | 2 | - | - | - | 1 | - |
| **CO4** | 2 | - | - | - | - | - | - | - | 2 | - | - | - | 1 | - |
|  |
| **3-2** |
| **C321** | **UNIVERSAL HUMAN VALUES -2** | **CO1** | Understanding the content and process for Value education.(L2) |
| **CO2** | Understanding the harmony in the human being, family, society and nature/existence(L2) |
| **CO3** | Apply the Strengthening of self-reflection.(L3) |
| **CO4** | Apply to All levels become sensitive to their commitment towards what they have understood (human values, human relationship and human society)(L3) |
| **CO5** | Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.(L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | - | - | - | - | 2 | 2 | 3 | - | 3 | - | 2 | - | - |
| **CO2** | - | - | - | - | - | 2 | 2 | 3 | - | 3 | - | 2 | - | - |
| **CO3** | - | - | - | - | - | 2 | 2 | 3 | - | 3 | - | 2 | - | - |
| **CO4** | - | - | - | - | - | 2 | 2 | 3 | - | 3 | - | 2 | - | - |
| **CO5** | - | - | - | - | - | 3 | 2 | 3 | - | 3 | - | 2 | - | - |
|  |
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| **C322** | **MICROPROCESSORS AND MICROCONTROLLERS** | **CO1** | Understandthearchitectureofmicroprocessorandtheirbasichardwarecomponentsandoperation.(L1) |
| **CO2** | Demonstrate programming skills in assembly language for processors.(L4)  |
| **CO3** | Analyze various interfacing techniques and apply them for the design of processor(L4) |
| **CO4** | Understand the architecture of microcontroller and their operation (L2) |
| **CO5** | Able to illustrate how the differenton ARM Cortexprocessors and debug.(L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | 2 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 1 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO4** | 3 | 2 | 2 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO5** | 1 | 2 | 3 | - | - | - | 3 | - | - | - | - | - | - | - |
|  |
| **C323** | **POWER SYSTEMS-III** | **CO1** | Find out the load flow solution of a power system network using different load flow methods.(L2) |
| **CO2** | Evaluate the fault current for different types of faults with a view to provide data for the design of protective devices.(L5) |
| **CO3** | Analyze the steady state and transient stability concepts of a power system.(L4) |
| **CO4** | Calculate optimal scheduling for generators **with and without losses**.(L3) |
| **CO5** | Acquire the knowledge of load frequency control **for various systems**.(L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 2 | 1 |
| **CO2** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 1 |
| **CO3** | 3 | 2 |  | - | - | - | - | - | - | - | - | - | 2 | 1 |
| **CO4** | 3 | 2 | - | - | - | - | - | - | - | - | 2 | 1 | 2 | 1 |
| **CO5** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | 2 | 1 |
|  |
| **C324** | **DIGITAL ELECTRONICS** | **CO1** | Distinguish the analog and digital systems, apply positional notations, number systems, computer codes in digital systems. (L3) |
| **CO2** | Understand the Boolean Algebra theorems, simplify and design logic circuits. (L4) |
| **CO3** | Implement combinational logic circuit design and modular combinational circuits using encoders, decoders, multiplexers and demultiplexers.(L6) |
| **CO4** | Understand the basic elements of sequential logic circuits.(L4) |
| **CO5** | Design and analyze sequential circuits. (L6) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 2 | 2 | - | - | - | - | - | - | 1 | - | - | - | 3 |
| **CO2** | 3 | 2 | 2 | - | - | - | - | - | - | 1 | - | - | - | 3 |
| **CO3** | 3 | 2 | 2 | - | - | - | - | - | - | 1 | - | - | - | 3 |
| **CO4** | 3 | 2 | 2 | - | - | - | - | - | - | 1 | - | - | - | 3 |
| **CO5** | 3 | 2 | 2 | - | - | - | - | - | - | 1 | - | - | - | 3 |
|  |
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| **C325** | **POWER SYSTEM PROTECTION** | **CO1** | Acquire the knowledge of protection systems and operation of circuit breakers (L2) |
| **CO2** | Describe the operating principles of various types of relays.(L2) |
| **CO3** | Select appropriate protection scheme for AC generator and transformer (L3) |
| **CO4** | Choose appropriate protection scheme for transmission lines and know about different neutral grounding techniques(L3) |
| **CO5** | Understand the reasons behind over voltages and operation of lightning arrester along with latest trends in protection system(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | - | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
|  |
| **C326** | **MICROPROCESSORS AND MICROCONTROLERS LAB**  | **CO1** | Understand and apply the fundamentals of assembly level programming of microprocessor.(L3) |
| **CO2** | Design and implement 8051 microcontroller based systems (L2) |
| **CO3** | Design interfacing circuits with 8086. (L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 1 | 1 | 1 | 2 | - | - | - | - | - | - | - | - | - |
|  |
| **C327** | **POWER SYSTEMS LAB** | **CO1** | Able to understand affect of various faults in various power system components.(L2) |
| **CO2** | Students can execute energy management systems functions at load(L3) |
| **CO3** | Able to determine the parameters of various power system components (L2) |
| **CO4** | Able to understand the power flows and stability in power system.(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 1 | 1 | 1 | 1 | 1 | - | - | - | 1 | - | - | - | - | 2 |
| **CO2** | 1 | 2 | - | - | - | - | - | - | 1 | - | - | - | - | 2 |
| **CO3** | 2 | 2 | 2 | 2 | - | - | - | - | 1 | - | - | - | - | 1 |
| **CO4** | 2 | 2 | 2 | 2 | - | - | - | - | 1 | - | - | - | - | 1 |
|  |
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|  **C328** | **ELECTRICAL SIMULATION LAB** | **CO1** | Simulate Single PhaseAc Voltage Controller; Transient Response of RLCCircuit. (L4) |
| **CO2** | Simulate Single Phase Inverter with PWM Control and Buck Chopper. (L3) |
| **CO3** | Simulate Integrator, differentiator and Modeling Of Transformer. (L4) |
| **CO4** | Simulate Single PhaseFull Bridge Converterand Three Phase Full Bridge Converter. (L5) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | - | - | - |
| **CO2** | - | - | 2 | - | - | - | - | - | - | - | 1 | - | - | - |
| **CO3** | - | 1 | - | - | - | - | - | - | - | 2 | - | - | - | - |
| **CO4** | - | - | 1 | - | - | - | - | - | - | - | 2 | - | - | - |
|  |
|  **C329** | **LOW VOLTAGE SWITCHGEAR(SAC)** | **CO1** | Understand the need for protection systems (L2) |
| **CO2** | Explain the principle and operation of various relays.(L3) |
| **CO3** | Explain the working of contactors (L3) |
| **CO4** | Perform the connections of different types of starters.(L3) |
| **CO5** | Analyze the need for MPCB, MCCB and RCCB.(L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 1 | 1 | - | 1 | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 1 | 1 | - | 1 | - | - | - | - | - | - | - | - | - |
| **4-1** |
| **C411** | **UTILIZATION OF ELECTRICAL ENERGY** | **CO1** | Describe about electric heating and welding procedures (L3) |
| **CO2** | Articulate the terminology of illumination, Explain the working of electric lamps and design of lightning schemes (L3) |
| **CO3** | Discuss systems of electric traction, speed-time curves and mechanics of movement.(L2) |
| **CO4** | Explain about braking methods used in traction systems and calculate different performance parameters of traction(L1) |
| **CO5** | Examine different real time electrical appliances and applications in electric vehicles(L4) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO2** | 3 | - | 1 | - | - | - | - | - | - | - | - | - | - | 1 |
| **CO3** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| **CO5** | 2 | 1 | - | - | - | - | 1 | - | - | - | - | - | 2 | - |
|  |
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| **C412** | **ELECTRIC DRIVES** | **CO1** | Understand the fundamentals of electric drive and different electric braking methods.(L2) |
| **CO2** | Analyze the operation of three phase converter fed dc motors and four quadrant operations of dcmotors using dual converters.(L4) |
| **CO3** | Describe the converter control of dc motors in various quadrants of operation (L2) |
| **CO4** | Know the concept of speed control of induction motor by using AC voltage controllers and Differentiate the stator side control and rotor side control of three phase induction motor.(L1) |
| **CO5** | Explain the speed control mechanism of synchronous motors(L2) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| **CO2** | 2 | 3 | 1 | 3 | - | - | - | - | - | - | - | 2 | 3 | 2 |
| **CO3** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| **CO4** | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 2 |
| **CO5** | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | 2 | 3 |
|  |
| **C413** | **ELECTRIC VEHICLES** | **CO1** | Understand the Evolution of Electric Vehicles.(L2) |
| **CO2** | Understand Electric vehicle dynamics and propulsion.(L2) |
| **CO3** | AnalyzeElectric and hybrid Electric vehicle Configurations (L4) |
| **CO4** | Explain the use of different Energy storage devices used for Electric vehicles.(L2) |
| **CO5** | Appreciatethe importance of EV Charging Technology.(L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 2 | 2 | - | - | - | 1 | - | - | - | - | - | 1 | - |
| **CO5** | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |
| **C414** | **PRINCIPLES OF SIGNALS AND SYSTEMS**  | **CO1** | Understand mathematical representation of various types of signals and classification of systems. (L2) |
| **CO2** | Analyse the characteristics of CT signals and CT systems using Fourier series and Fourier transform. (L4) |
| **CO3** | Determine the response of LTI system. Understand the concept of convolution, correlation, applying of sampling technique. (L4) |
| **CO4** | Compute Laplace transforms to analyze continuous time signals and systems and understandthe concept of region of convergence. (L3) |
| **CO5** | Compute Z-transform to analyze discrete-time signals and systems, and understand the concept of region of convergence. (L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO2** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO3** | 3 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO4** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 |
| **CO5** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 |
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| **C415** | **NEURAL NETWORK & FUZZY LOGIC** | **CO1** | Understand the concept of artificial neuron.(L4) |
| **CO2** | Know various ANN architectures and learning strategies. (L3) |
| **CO3** | Understand ANN paradigm and its application to solve Electrical Engineering problems. (L3) |
| **CO4** | Understand fuzzy set theory and membership functions. (L2) |
| **CO5** | Design Fuzzy Logic System for Electrical Engineering problems. (L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 1 | - | - | - | - | - | - | - | - | - | 1 | 3 | 1 |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | 3 | 2 |
| **CO3** | 2 | 3 | - | - | - | - | - | - | - | - | - | 2 | 2 | 3 |
| **CO4** | 3 | 3 | - | - | - | - | - | - | - | - | - | 2 | 3 | 3 |
| **CO5** | 3 | 3 | - | - | - | - | - | - | - | - | - | 2 | 3 | 3 |
|  |
| **C416** | **DATA ANALYTICS FOR SMART GRIDS**  | **CO1** | Understand the basics of conventional grid and Transformation to smart grid using new technologies.(L2) |
| **CO2** | Describe the major components, grid layout and standards of smart grids.(L2) |
| **CO3** | Interpret the various smart grid communication and measurement technologies.(L3) |
| **CO4** | Analyze the data collection devices and data management in smart grids.(L4) |
| **CO5** | Appraise the different power system issues using data analytic tools.(L5) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | - | - | 2 | - | 3 | - | - | - | 2 | 2 | 2 | 2 | - | 2 |
| **CO2** | - | - | 2 | - | - | - | - | - | - | 2 | 2 | 2 | - | 2 |
| **CO3** | - | - | - | - | - | - | - | - | 2 | 3 | 2 | 2 | - | 2 |
| **CO4** | - | - | 2 | - | 2 | - | - | - | - | 2 | 3 | 2 | - | 2 |
| **CO5** | - | - | - | - | 2 | - | - | - | - | 2 | 2 | 2 | - | 2 |
|  |
| **C417** | **POWER BI (SAC)** | **CO1** | Understand Power BI Desktop layouts, BI reports and relationships in your data model and learn data visualization. (L2) |
| **CO2** | Apply transformations and Prepare data for analysis (L3) |
| **CO3** | Analyze the reports in Power BI Using DAX commands and functions.(L4) |
| **CO4** | Evaluate the results generated in the Reports. (L5) |
| **CO5** | Implementing Power Apps for Mobile and Tablet (L3) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 3 | - | - | 3 | - | - | - | - | - | 2 | 2 | - | 2 |
| **CO2** | 2 | 3 | - | - | 3 | - | - | - | - | - | 3 | 2 | 1 | - |
| **CO3** | 2 | 3 | - | - | 3 | - | - | - | - | - | 2 | 2 | 2 | 1 |
| **CO4** | 2 | 3 | - | - | 3 | - | - | - | - | - | 2 | 2 | - | 2 |
| **CO5** | 2 | 3 | - | - | 3 | - | - | - | - | - | 2 | 2 | 2 | - |
|  |
| **VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY** |
| **DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING** |
| **CO-PO-PSO GRAND MATRIX** |
| **4-2** |
| **C426** | **PROJECT STAGE -II** | **CO1** | Demonstrate the technical knowledge to identify problems in the field of Electrical & Electronics Engineering and its allied areas.(L3)  |
| **CO2** | Analyze and formulate technical projects with a comprehensive and systematic approach(L4) |
| **CO3** | Identify the modern tools to implement technical projects(L2) |
| **CO4** | Design engineering solutions for solving complex engineering problems (L5) |
| **CO5** | Develop effective communication skills, professional behavior and team work (L5) |
|  |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 |  | 1 |  | 1 | 1 |  | 1 | 1 |  |  | 3 | 1 |
| **CO2** | 2 | 2 | 3 | 3 |  | 1 | 1 | 1 | 1 | 3 |  | 2 | 3 | 1 |
| **CO3** | 2 | 2 | 3 | 2 | 3 |  |  |  |  |  |  |  | 3 | 2 |
| **CO4** | 2 | 3 | 3 | 3 |  | 2 | 2 |  |  |  |  |  | 3 | 1 |
| **CO5** |  |  |  |  |  |  |  | 2 | 3 | 3 | 3 | 3 |  | 2 |