ELECTRICAL & ELECTRONICS ENGINEERING

V & VI SEMESTER

With
Scheme of Teaching
& Examination
# DEPARTMENT: ELECTRICAL & ELECTRONICS ENGINEERING

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Qualification</th>
<th>Position</th>
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<tbody>
<tr>
<td>1</td>
<td>Dr. Nagesh Prabhu</td>
<td>M.Tech, Ph.D.</td>
<td>Professor &amp; HOD</td>
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<tr>
<td>2</td>
<td>Dr. Satyendra Kumar</td>
<td>Ph.D.</td>
<td>Professor</td>
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<tr>
<td>3</td>
<td>K. Vasudeva Shettigar</td>
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<td>Associate Professor</td>
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<td>Mr. Suryanarayana K.</td>
<td>M.Tech (on Ph.D.)</td>
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<td>5</td>
<td>Mrs. Nayana P Shetty</td>
<td>M.Tech (Ph.D.)</td>
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<td>Mr. Rajaneesh Acharya</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<td>7</td>
<td>Mr. Naveen J</td>
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<td>8</td>
<td>Mr. Pradeep Kumar</td>
<td>M.Tech (Ph.D.)</td>
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<tr>
<td>9</td>
<td>Mrs. Latha Shenoy</td>
<td>M.Tech (Ph.D.)</td>
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<td>10</td>
<td>Ms. Anitha Marina Colaco</td>
<td>M.Tech (on Ph.D.)</td>
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<td>11</td>
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<td>12</td>
<td>Mrs. Raksha Adappa</td>
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<td>18</td>
<td>Mr. Dinesh Shetty</td>
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<tr>
<td>19</td>
<td>Mr. Ravikiran Rao</td>
<td>M.Tech</td>
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<tr>
<td>20</td>
<td>Ms. Swathi Hatwar H.</td>
<td>M.Tech</td>
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</table>
VISION:

Pursuing excellence in Electrical & Electronics Engineering, creating a research environment to promote innovation and address global challenges.

MISSION:

- To equip students to face global challenges by excelling in professional career and higher education.
- To offer high quality graduate and post graduate programs in electrical & electronics engineering.
- To promote excellence in research, collaborative activities and contribute to social development with ethical values.

Programme Educational Objectives (PEOs):

1. Excel in professional career and / or higher education by acquiring knowledge in mathematical, electrical, electronics and computer engineering principles.
2. Analyze real life problems, design Electrical and Electronics & multidisciplinary Engineering systems and solutions that are socially acceptable.
3. Inculcate and exhibit ethical values, communication skills and provide supportive and leadership roles in their profession to emerge as excellent professionals and adapt to current trends by engaging in lifelong learning.
Programme Outcomes (POs):

B.E, (E&E) Engineering students will attain the following outcomes at the end of the Programme.

a. An ability to apply knowledge of Mathematics, Science and engineering fundamentals to Electrical & Electronics systems.

b. An ability to analyze Electrical & Electronics Engineering problem, identify and formulate the appropriate solution.

c. An ability to design and conduct experiments, as well as to analyze, interpret and validate data.

d. An ability to investigate and design a system, component or process to meet desired needs within realistic constraints.

e. An ability to use emerging Technologies, skills, and modern tools necessary for practicing Electrical Engineering.

f. An ability to identify, formulate and solve Electrical Engineering problems and contribute effectively for the development of the society

g. An ability to engage in sustainable design, keeping legal, social, environmental, health and safety issues.

h. An understanding of professional and ethical responsibility.

i. An ability to function in multidisciplinary teams.

j. An ability to communicate effectively.

k. An understanding of economic aspects of Electrical & Electronics Engineering and Management principles to manage the projects and finance.
1. An ability to strengthen the knowledge and understanding of Electrical & Electronics Engineering systems by engage in lifelong learning.
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<th>Sl. No.</th>
<th>Code</th>
<th>Subject</th>
<th>Theory/Tuto./Prac./ Self Study</th>
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LINEAR INTEGRATED CIRCUITS

Sub Code : 13EE501  
Credits : 04
Hrs/Week : 4+0+0+0  
Total Hours : 52

Course Outcomes:
At the end of the course student will be able to
1. Differentiate ideal and practical op-amp and identify various practical op-amp specifications and measure offset error voltages / currents and other critical parameters.
2. Analyze and design the direct coupled and capacitor coupled operational amplifier circuits. And discuss op-amp circuit stability issues and frequency compensating methods.
3. Use the op-amp in signal processing applications, active filters and design such circuits.
4. Analyze the non-linear behavior of the op-amp and design op-amp circuits in open loop and with positive feedback.
5. Analyze and design application circuits using specialized ICs such as 555 timer, power amplifier, voltage regulators, PLL.

UNIT – I

7 Hours

OP-AMP as an AC Amplifier: Capacitor Coupled Voltage Follower, High Zin capacitor coupled voltage follower, capacitor coupled non-inverting amplifier, High Zin capacitor coupled non-inverting amplifier, Capacitor coupled inverting amplifier  
4 Hours

UNIT – II
Setting upper cut-off frequency, capacitor coupled difference amplifier, use of single polarity supply.  

3 Hours

**OP-AMP Frequency Response and Compensation:** Op-Amp circuit stability, frequency and phase response, frequency compensating methods, Manufacturer’s recommended compensation, op-amp circuit bandwidth, slew rate effects, stray capacitance effects, load capacitance effects, Zin Mod compensation, Circuit stability precautions.  

8 Hours

**UNIT – III**

**Signal Processing Circuits:** Precision Half wave and full wave rectifiers, limiting circuits, Clamping circuits, peak detectors, sample and hold circuits. V/F and F/V Converters.  

5 Hours

**OP-AMP Non linear Circuits:** Op-Amps in switching circuits, crossing detectors, inverting Schmitt trigger circuits, Non-inverting circuits, Astable multivibrators, Monostable multivibrators, op-amp based SCR triggering circuit.  

5 Hours

**UNIT – IV**

**Active Filters:** First and Second order high pass and low pass filters. Band pass filter, Band stop filters. Higher order filters.  

6 Hours

**Specialized IC Applications:** Universal active filters, Phase locked loops, Power amplifiers.  

3 Hours

**UNIT - V**

**555 TIMER** - Monostable and Astable multivibrators and applications,  

3 Hours
DC-Voltage Regulators: Voltage regulator basics, Voltage follower regulator, adjustable output regulator, Precision voltage regulator, Integrated Circuit voltage Regulator.  8 Hours

TEXT BOOKS:
1. David A Bell, Operational Amplifier and Linear IC’s, PHI
2. Ramakanth Gayakwad, Operational Amplifiers and Linear IC’s – PHI / Pearson Education.

REFERENCE BOOKS:
1. Roy Choudhry, Operational amplifiers and Linear Integrated circuits – New Age International.

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DIGITAL SIGNAL PROCESSING

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<td>Hrs/Week</td>
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*Note: Lecture hour indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Course Outcomes:
At the end of the course student will be able to
1. Analyze the signals in discrete time domain
2. Convert the signals from analog domain to digital domain
3. Analyze the signals in frequency domain using Fourier transforms and Z-transforms
4. Design and implement filters using finite impulse response and infinite impulse response techniques
5. Analyze the various kinds of errors taking place while sampling

UNIT – I

SIGNALS AND SYSTEMS : Basic elements of digital signal Processing – Concept of frequency in continuous time and discrete time signals – Sampling theorem – Discrete time signals. Discrete time systems – Analysis of Linear time invariant systems – Z transform – Convolution and correlation. 8+5 Hours

UNIT – II

FAST FOURIER TRANSFORMS : Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering and correlation. 8+6 Hours

UNIT – III

IIR FILTER DESIGN : Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain. 8+5 Hours

UNIT – IV

FIR FILTER DESIGN: Symmetric & Antisymetric FIR filters – Linear phase filter – Windowing technique – Rectangular, Kaiser windows – Frequency sampling techniques – Structure for FIR systems. 7+5 Hours
UNIT - V


8+5 Hours

TEXT BOOK:


REFERENCE BOOKS:


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LINEAR CONTROL SYSTEMS

Sub Code : 13EE503
Hrs/Week : 3*+2+0+0

Credits : 04
Total Hours : 39*+26

*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Course Outcomes:
At the end of the course student will be able to
1. Develop mathematical model of linear systems and model reduction using block diagram and signal flow graphs.
2. Perform the time domain analysis of control system.
3. Understand the concept of stability.
4. Test the transfer function of the physical systems for stability using different control techniques.
5. Expound the frequency domain analysis of given system.

UNIT - I
Modeling of Systems: The control system, Mathematical models of physical systems – electrical Mechanical, electro-mechanical systems, (Mechanical accelerometer, Levered systems excluded), Gear trains, Analogous systems, Introduction to state space modeling simple systems.

8+5 Hours

UNIT – II

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded)  

5+3 Hours


3+2 Hours

UNIT – III

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis

4+2 Hours


4+3 Hours

UNIT – IV
**Frequency domain analysis:** frequency response specification, Correlation between time and frequency response, Bode plots, All pass, minimum & non-minimum phase systems, Assessment of relative stability using Bode Plots, determination of transfer functions from bode plots.  

7+6 Hours

**UNIT - V**

**Polar plots, Nyquist Criteria:** Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist plots  

4+3 Hours

Compensators, lead lag networks, Controllers P, PI, PID (qualitative analysis)  

4+2 Hours

**TEXT BOOK :**


**REFERENCE BOOKS:**


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**POWER ELECTRONICS**

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**Course Outcomes:**
At the end of the course student will be able to
1. Distinguish different types of power semiconductor devices, converters and their characteristics.
2. Explain the principle of operation of thyristors with their characteristics and analyze various thyristor firing circuits, commutation methods and protection circuits used.
3. Describe the principle of operation of AC voltage controller, controlled rectifiers circuits and evaluation of performance parameters.
4. Explain different types of chopper configurations and methods of control.
5. Describe the principle of operation of single phase and three phase inverters circuits.

UNIT – I

Introduction, Power Semiconductor Devices: Applications of Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic circuits. Peripheral effects. 4 Hours

Power Transistors: Power BJT’s – switching characteristics, switching limits, base drive control. Power MOSFET’s – switching characteristics, gate drive. IGBT’s, di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. 7 Hours

UNIT – II

Thyristors: Introduction, characteristics. Two Transistor Model. Turn-on and turn-off. di/dt and dv/dt protection. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits, UJT, Sample design of firing circuits using UJT. 6 Hours

Commutation Techniques: Introduction. Natural Commutation. Forced commutation: self commutation, impulse commutation, resonant pulse commutation and complementary commutation. 5 Hours

UNIT – III

5 Hours


5 Hours

UNIT – IV


10 Hours

UNIT – V


10 Hours

TEXT BOOK:
2. REFERENCE BOOKS
GENERATION, TRANSMISSION AND DISTRIBUTION

Sub Code : 13EE505                  Credits : 04
Hrs/Week : 4+0+0+S*                Total Hours : 52

*Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.

Course Outcomes:
At the end of the course student will be able to
1. Understand methods of generation of electrical power and their pros and cons
2. Appreciate the economical aspects of electrical power and typical transmission & distribution systems scheme
3. Understand the concepts associated with overhead transmission line and insulators
4. Understand the concepts associated with underground cables and line parameters
5. Comprehend the characteristics & performance of power transmission lines and introduce the concept of FACTS and HVDC.

UNIT - I

Electrical Power Generation: Hydro Power generation-selection of site, classification of hydroelectric plants, general arrangement and operation, hydroelectric plant power station structure and control.
Thermal Power generation- Introduction, main parts, working, plant layout, Diesel Electric plants, Gas turbine plants-components, layout, advantages over steam turbine plant
Nuclear Power Station- Introduction, Adverse effects of fossil fuels, components of reactors, Description of fuel sources 8 Hours

Self Study Topics: {Pros and Cons of nuclear power generation, Safety of nuclear power reactor, concept of co-generation} 4 Hours

UNIT – II
Economics Aspects: Introduction, Terms commonly used in system operation, Definitions of diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor, loss factor. Load duration curve, energy load curve and types of tariffs. 4 Hours

Self Study Topics: {Typical transmission & distribution systems scheme: General layout of power system, Standard voltages for transmission. Requirement of EHV transmission, Advantage of high voltage transmission. Feeders, distributors & service mains.}

Distribution: Requirements of power distribution, ac distribution - radial & ring main systems calculation for concentrated loads. 6 Hours

UNIT - III
Overhead transmission lines: sag calculation in conductors a) suspended on level supports b) support at different levels. Effect of wind & ice tension & sag at erection, Line vibration damper. 6 Hours

Insulators: Types, potential distribution over a string of suspension insulators. String efficiency & methods of increasing strings efficiency
Self Study Topics {Testing of insulators. Insulation coordination – need and principle (qualitative)}. 4 Hours

UNIT – IV

Self Study Topics: {Underground cables: Types, material used, insulation resistance, thermal rating of cables, charging current} Grading of cables, capacitance grading & inter sheath grading. 4 Hours

Line parameters: calculation of inductance of single phase, 3phase lines with equilateral & unsymmetrical spacing. Inductance of composite conductor lines (GMR and GMD), capacitance calculation for single circuit and double circuit three-phase line with equilateral & unsymmetrical spacing. 6 Hours
UNIT – V

Characteristics & performance of power transmission lines: Short transmission lines, medium transmission lines- nominal T, end condenser and pi models, long transmission lines, 5 Hours

Self Study Topics: {ABCD constants of transmission lines, Ferranti effect, line regulation.}
Introduction FACTS & HVDC Transmission 5 Hours

TEXT BOOKS:
3. M.V. Deshpande, Elements of Power Station Design, A.H.Wheeler and co

REFERENCE BOOKS:
TRANSFORMERS AND INDUCTION MACHINES
LABORATORY

Sub Code : 13EE506
Credits : 02
Hrs/Week : 0+0+3+0
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Test the transformer for its efficiency and regulation.
2. Determine torque slip characteristics of an induction machine.
3. Control the speed of three phase induction machine.
4. Parallel operation and three phase connections of single phase transformers
5. Performance evaluation of 3-phase induction machine using circle diagram and equivalent circuit analysis.

List of Experiments

2. Sumpner’s test.
3. Parallel operation of two dissimilar (different KVA) 1-phase transformers.
4. Polarity test & connection of 3 single phase transformers in star – delta and determination of efficiency & regulation – for balanced direct loading for UPF.
5. Scott connection- for balanced and unbalanced two phases UPF loads.
8. Obtain the equivalent circuit diagram of a 3-phase I.M. & from equivalent circuit diagram obtain its performance evaluation.
9. Speed control of 3-phase induction motor- stator voltage control & rotor resistance control (performance circuits for at least two different voltages/ two rotor resistance values).
10. Load test on- induction generator.
11. Load test on 1 phase induction motor.
12. Speed control of 3-phase induction motor by V/f method

**CIRCUITS, MEASUREMENTS & CONTROL LABORATORY**

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**Course Outcomes:**
At the end of the course student will be able to

1. Verify various network theorems and measure capacitance and inductance using bridges
2. Measure active and reactive power in three phase circuit.
3. Adjustment & calibration of 1-phase energy meter and Determination of ratio & phase angle error in CT.
4. Determination of conversion time and effect of clock frequency on conversion time in ADC 0808 and DAC 0800
5. Understand the frequency response of Lag, lead, lag-lead network and performance evaluation of P, PI, PID controllers

**List of Experiments:**

**Module 1:**

1. Verification of Superposition and Reciprocity theorems
2. Verification of Thevenin’s, Nortons’ and Maximum power transfer theorem
3. Measurement of active and reactive power in balanced 3-phase circuit using two-watt meter method
4. Characteristics of series and Parallel resonance
5. Measurement of Capacitance and Inductance using AC bridges

**Module 2:**

6. Determination of ratio & phase angle error in CT.
7. Adjustment & calibration of 1-phase energy meter.
8. Determination of conversion time and effect of clock frequency on conversion time in ADC 0808 and DAC 0800

**Module 3:**

9. Frequency response of Lag, Lead networks
10. Frequency response of Lag-lead networks
11. DC and AC Servo motor characteristics, Synchro transmitter-receiver pair.
12. Performance characteristics of P, PI, and PID controller
POWER SEMICONDUCTOR DEVICES

Sub Code : 13EE511
Credits : 03
Hrs/Week : 3+0+0+0
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to

1. Overview of power semiconductor devices with selection strategy, types and characteristics of power diodes
2. Explain the principle of operation of MOSFET with their characteristics and effect of reverse recovery transients on switching stresses & losses
3. Explain the principle of operation of IGBT with their characteristics and protection against over-current & short-circuit
4. Understand the construction and features of the emerging power electronic devices
5. Understand the importance of gate drive circuits for power devices, design of snubber and heat sink

UNIT – I

Introduction: Power switching devices overview – Attributes of an ideal switch, application requirements, circuit symbols; Power handling capability – (SOA); selection strategy – On-state and switching losses – EMI due to switching – Power diodes – Types, forward and reverse characteristics, switching characteristics – rating

UNIT – II

Power MOSFET: Basic structure & operation, I-V Characteristics, On-state operation, Turn-on, turn-off process, Switching characteristics: Turn-on transient, dv/dt capability, Turn-off transient, turn-off time, Switching losses, Safe operating Area, Effect of reverse recovery
transients on switching stresses & losses, dv/dt limitations.  **8 Hours**

**UNIT – III**

**Power IGBT:** basic structure & operation, i-v characteristics, Latch-up in IGBT, Switching characteristics: turn-on, Turn-off transient, current tailing, Switching losses, Device limits & SOA, Over-current & short-circuit protection of IGBT  **8 Hours**

**UNIT - IV**

**Power Electronics Devices:** Construction and features of - Phase Controlled thyristors, inverter graded thyristors, ASCR, RCT, SUS, SBS, SCS,GTO, MCT, SIT, IGCT, MTO, ETO, PIC. Comparison of power devices.  **8 Hours**

**UNIT - V**

**Firing and Protecting Circuits:** Necessity of isolation, pulse transformer, optocoupler – Gate drives circuit: SCR, MOSFET, IGBTs and base driving for power BJT. - Over voltage, over current and gate protections; Design of snubbers, Guidance for heat sink selection, heat sink types and design – Mounting types.  **9 Hours**

**TEXT BOOKS:**


**REFERENCE BOOKS:**


2) B.W Williams ‘Power Electronics Circuit Devices and Applications’. 
ENERGY MANAGEMENT AND AUDIT

Sub Code : 13EE512  
Credits : 03  
Hrs/Week : 3+0+0+0  
Total Hours : 42

Course Outcomes:

At the end of the course student will be able to
1. Understand the energy situation and need for energy economic analysis
2. Understand the concept of energy auditing.
3. Comprehend various energy tariffs and understand the need for pf correction.
4. Understand the need for Electrical System Optimization
5. Understand the concept of Demand Side Management

UNIT - I
4 Hours

Energy Economic Analysis: The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems.  
4 Hours

UNIT - II
Energy Auditing: Introduction, Elements of energy audits, energy use profiles, measurements in energy audits, presentation of energy audit results.  
8 Hours
UNIT - III
Electrical Equipment and power factor - correction & location of capacitors, energy efficient motors, lighting basics, electrical rate tariff.

8 Hours

UNIT - IV
Electrical System Optimization: The power triangle, motor horsepower, power flow concept.

7 Hours

UNIT – V
Demand Side Management: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning, load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization of Energy Conservation awareness Programs.

8 Hours

Text Books:
3. Pabla “Electrical distribution”, TMH, 2004

References Books:
4. Hand book on energy auditing - TERI (Tata Energy Research Institute)

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OBJECT ORIENTED PROGRAMMING USING C ++

Sub Code : 13EE513  Credits : 03
Hrs/Week : 3+0+0+0  Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Understand the concept of Object Oriented programming and its realization in C++
2. Comprehend the concept of functions and classes
3. Understand the concepts of objects constructors and destructors
4. Enumerate the meaning of operator overloading type conversion and inheritance
5. Understand the concepts of pointers virtual functions and polymorphism and importance of managing console I/O, File I/O.

UNIT - I

3 Hours

The Basic Language C++: A comparison of C and C++, Structure of C++ program with Class, Preprocessor directives, C++ Statements – Input/Output, Comments, Tokens, Keywords, Identifiers, Constants, Data types – string, pointer, reference, boole, enumeration, array, complex number; typedef names, type compatibility, type conversion, qualifier – const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions – New and Delete.  

5 Hours

UNIT – II

Classes: Introduction – declaration and definition of a Class, defining member functions, C++ program with a Class, Making an outside function Inline, Nesting of member functions, Arrays within a class, Static data members, static member functions

UNIT – III

Objects: global & local objects, scope & lifetime, memory allocation for objects, dynamically allocated objects, pointers to objects, arrays of objects, function arguments with objects, returning objects; const member functions.

Constructors and Destructors: Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors.

UNIT – IV

Operator Overloading and Type Conversion: Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using Friends, Rules for overloading operators, overloading a comma operator, overloading the output operator, Type conversion.

Inheritance: Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes.

UNIT – V
**Pointer, Virtual Functions and Polymorphism:** Introduction, Pointers, Pointers to Objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions.

**Managing Console I/O and File I/O:** C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Methods of Opening and Closing a File, Examples of Opening file using constructor open(), file modes (simple programming exercises).

**TEXT BOOKS:**

**REFERENCE BOOKS:**

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**FUZZY LOGIC CONTROL**

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**Course Outcomes:**
At the end of the course student will be able to
1. Understand the basics of Fuzzy logic
2. Differentiate between fuzzy and linguistic variables and study the concept of inference rules
3. Understand Fuzzy control systems
4. Understand Fuzzy knowledge based controllers (FKBC)
5. Analyze Process performance monitoring, adaption mechanism.

UNIT - I

Introduction: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle.

7 Hours

UNIT - II


8 Hours

UNIT – III

Fuzzy control systems: Control design problem, Control surface, Assumptions in a Fuzzy control system design, Simple fuzzy logic controllers, Examples of fuzzy logic controllers, Aircraft Landing control problem, washing machines, traffic regulations, lift control, Fuzzy Engineering process control,

10 Hours

UNIT - IV

Fuzzy knowledge based controllers (FKBC): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, FKBC as a linear transient element, PID like FKBC, sliding mode FKBC, Sugeno FKBC.

8 Hours

UNIT - V

ADAPTIVE FUZZY CONTROL: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based
controller.  

**6 Hours**

**TEXT BOOKS:**


**REFERENCE BOOKS:**


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ADVANCED INSTRUMENTATION SYSTEM

Sub Code : 13EE515
Credits : 03
Hrs/Week : 3+0+0+0
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Understand various aspects of instrumentation
2. Appreciate the need of analyzer
3. List various measuring instruments and understand their characteristics. Also understand the concept of measurement of power
4. Comprehend with the working of various transducers
5. Appreciate the need of Data acquisition, conversion and transmission.

UNIT - I
Instrumentation: Frequency meter, measurement of time and frequency (mains), tachometer, phase meter, capacitance meter. Automation in digital Instrumentation. 7 Hours

UNIT – II
Analyzer: Wave analyzers and Harmonic distortion, Basic wave analyzer, Frequency selective wave analyzer, Harmonic distortion analyzer and Spectrum analyzer. 8 Hours

UNIT – III
Measuring Instruments: Output power meters, Field strength meter Vector impedance meter, Q meter applications-Z, Z 0 and Q. Basic LCR bridge, RX meters. 5 Hours

Measurement of power: Measurement of large amount of RF power (calorimetric method), measurement of power on a transmission line, standing wave ratio measurements, 4 Hours

UNIT – IV
Transducers: Synchro’s, Capacitance Transducers, Load cells, Piezo electrical Transducers, IC type temperature sensors, Pyrometers, Ultrasonic temperature Transducer, Reluctance pulse pick-ups, Flow measurement-mechanical Transducers; Magnetic flow meters, turbine flow meters. β-gauge.

UNIT – V
Data acquisition and conversion: Generalized data acquisition system (DAS), Signal conditioning of inputs, single channel DAS, multi channel DAS, data loggers, compact data logger. 4 Hours

Data transmission: universal serial bus, IEEE-1394. Long distance data transmission (modems). IEEE 488 bus. Electrical interface. 3 Hours

REFERENCE BOOKS:
2. Modern Electronic Instrumentation and Measuring Techniques, Cooper D and A D Helfrick, PHI, 2009

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POWER SYSTEMS ANALYSIS & STABILITY

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*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Course Outcomes: At the end of the course student will be able to
1. Gain the knowledge pertaining to network representation: per-unit system, balanced networks, single line diagrams.
2. Analyze Power systems components and modelling: transformers, transmission lines, cables, rotating machines, and loads.
3. Comprehend symmetrical & unsymmetrical faults in power system, symmetrical components, selection of circuit breakers.
4. Analyze Rotor dynamic, swing equation, concepts of power system stability.

UNIT – I

REPRESENTATION OF POWER SYSTEM COMPONENTS: Circuit models of Transmission line, Synchronous machines, Transformer and Load. One line diagram, Impedance diagram, Per Unit notation, Selection and change of base for Per Unit quantities, Per Unit Impedance diagram of power system. 8+5 Hours

UNIT – II

SYMMETRICAL 3 PHASE FAULTS: Short Circuit currents and reactance of Synchronous machines, Short circuit current calculations of unloaded and loaded Generators and Power Systems, symmetric short circuit MVA calculations, Short circuit current computation through Thevinin’s theorem, Selection of circuit breakers. 8+5 Hours

UNIT – III

SYMMETRICAL COMPONENTS: Symmetrical component transformation, Resolution of unbalanced phasors into their symmetrical components and vice-versa, Power in terms of symmetrical components, Phase shift of symmetrical components in Star – Delta transformer bank. Positive, Negative and Zero Sequence impedances and Sequence
networks of power system elements (Transmission line, Synchronous machine and Transformer). 8+5 Hours

UNIT – IV

UNSYMMETRICAL FAULTS: Symmetrical component analysis of Unsymmetrical faults, Line-To-Ground (L-G), Line-To-Line (L-L), Double Line-To-Ground (L-L-G) faults on an Unloaded Alternator and Power System with and without fault impedance and connections of sequence networks. Open conductor faults in power systems. 7+6 Hours

UNIT – V

POWER SYSTEM STABILITY: Steady-state and Transient stability, Rotor dynamics and the Swing equation, Power angle equation. Equal – Area criterion of stability and its applications. Numerical solution of swing equation. 8+5 Hours

TEXT BOOKS:

REFERENCE BOOKS:

SWITCHGEAR AND PROTECTION

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*Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.

**Course Outcomes:**
At the end of the course student will be able to
1. Justify the necessity of switches and fuses and the importance of grounding systems
2. Understand the principles of circuit breaker and their types.
3. Comprehend the construction and working principle of different types of circuit breakers and relays.
4. Distinguish and apply various protection schemes.
5. Identify various protection schemes for generators and transformers.

**UNIT - I**
**Self Study Topics** {Switches and fuses: Isolating switch, load breaking switch, Fuse law, cut -off characteristics, Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse.} 4 Hours

**Grounding Systems:** Introduction, resistance grounding systems, neutral grounding, ungrounded system, resonant grounding, solid grounding, reactance grounding, resistance grounding, earthing transformer, neutral grounding transformer 7 Hours

**UNIT - II**
**Principals of circuit breakers:** Principles of AC Circuit breaking, Principles of DC Circuit breaking, problems encountered in DC breaking, Initiation of arc, maintenance of arc, Arc interruption - high resistance and low resistance interruption, Arc interruption theories –Slepian’s theory and energy balance theory, Re-striking voltage, recovery voltage, Rate of rise of Re-striking voltage, current chopping, capacitance switching, resistance switching.
**Self Study Topics:** {Rating of Circuit breakers. Operating mechanism of breakers.} 10 Hours
UNIT – III

Circuits Breakers: Air Circuit breakers – Air break and Air blast Circuit breakers, oil Circuit breakers - Single break, double break and minimum OCB, SF6 breaker - Preparation of SF6 gas, Puffer and non Puffer type of SF6 breakers

6 Hours

Vacuum circuit breakers - Construction, principle of operation, advantages and disadvantages of different types of Circuit breakers

Self Study Topics: {Testing of Circuit breakers, Unit testing, synthetic testing short circuit test lay out.}

4 Hours

UNIT – IV

Protective Relaying: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying

Self Study Topics: {Classification of Protective Relays}

3 Hours

Induction type relay: Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay – Principle of operation, percentage differential relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay,

Self Study Topics: {Microprocessor based over current relay – block diagram approach.}

8 Hours

UNIT - V

Protection Schemes:
Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over speeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter-turn faults

6 Hours
Induction motor protection – Protection against electrical faults such as phase fault, ground fault

**Self Study Topics:** Protection of Induction Motor against abnormal operating conditions such as single phasing, phase reversal, overload.

4 Hours

**TEXT BOOKS:**
2. Badriram & Viswa Kharma “Power System Protection & Switchgear”, TMH, (GS)

**REFERENCE BOOKS:**
1. Chakraborty, Soni, Gupta & Bhatnagar, “A Course in Electrical power” Dhanapatirai. Publication,
ELECTRICAL MACHINE DESIGN & CAD

Sub Code : 13EE603
Credits : 04
Hrs/Week : 3*+2+0+0
Total Hours : 39*+26

*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Course Outcomes:
At the end of the course student will be able to
1. Describe the design process and basic CAD practices for engineering design and drawing.
2. Analyze the design of DC machines
3. Understand the Design of single phase and three phase transformer.
4. Understand the Design of Induction machine.
5. Analyze the design of Synchronous machines

UNIT –I

PRINCIPLES OF ELECTRICAL MACHINE DESIGN:
Introduction, considerations for the design of electrical machines, limitations. Different types of materials and insulators used in electrical machines. 3+1 Hours

Introduction to CAD:
Study of auto CAD graphics package. Exercises on computer aided electrical drawing - single line diagram for a typical substation. 3+1 Hours

UNIT – II

DESIGN OF DC MACHINES: Output equation, choice of specific loadings and choice of number of poles, design of Main dimensions of the DC machines, Design of armature slot dimensions, commutator and brushes, magnetic circuit - estimation of ampere turns, design of yoke and
poles, field windings – shunt, series and inter poles.  

8+6 Hours

UNIT – III

DESIGN OF TRANSFORMERS (Single phase and three phase): Output equation for single phase and three phase transformers, choice of specific loadings, expression for volts/turn, determination of main dimensions of the core, types of windings and estimation of number of turns and cross sectional area of Primary and secondary windings, estimation of no load current, expression for leakage reactance and voltage regulation. Design of tank and cooling tubes (round and rectangular).  

9+6 Hours

UNIT – IV

DESIGN OF INDUCTION MOTORS: Output equation, Choice of specific loadings, main dimensions of three phase induction motor, Stator winding design, choice of length of the air gap. Estimation of number of slots for the squirrel cage rotor, design of Rotor bars and end ring, design of Slip ring Rotor, Estimation of no load current and leakage reactance  

8+6 Hours

UNIT – V

DESIGN OF SYNCHRONOUS MACHINES: Output equation, Choice of specific loadings, short circuit ratio, design of main dimensions, armature slots and windings, slot details for the stator of salient and non-salient pole synchronous machines, design of rotor of salient pole machines, magnetic circuits, dimensions of the pole body, design of the field winding, and design of rotor of non-salient pole machine.  

8+6 Hours

TEXT BOOKS:

2. Design of Electrical Machines - V. N. Mittle, 4th edition

**REFERENCE BOOKS:**

4. Manuals of Auto - CAD

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**POWER ELECTRONICS LABORATORY**

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**Course Outcomes:**

At the end of the course student will be able to

1. Understand the static characteristics of MOSFET, IGBT and SCR and identify different regions of operation.
3. Build AC voltage controller circuit using TRAIC DIAC combination and verify its application in speed control of IM and universal motor.
4. Test the performance of Single -phase full-wave rectifier with \( R / R-L \) loads. And MOSFET/IGBT based single-phase full-bridge inverter connected to R load.

**List Experiments:**
1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier /A.C. voltage controller.
6. A.C. voltage controller using TRIAC and DIAC combination connected to R and R-L loads.
7. Speed control of a separately excited D.C. motor using an IGBT/ MOSFET chopper.
8. Speed control of a stepper motor.
10. MOSFET/IGBT based single-phase full-bridge inverter connected to R load.
11. Auxiliary and LC commutation circuit.
12. DSP based speed control of motor

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ELECTRICAL CAD LABORATORY

Sub Code     : 13EE605
Credits         :   01
Hrs/Week     : 0+0+2+0
Total Hours  : 29

Course Outcomes:
At the end of the course student will be able to
1. Use the CAD tools to draw single line diagrams of electrical substation
2. Use the electrical CAD software to draw the DC winding diagram and AC winding diagrams
3. Use the electrical CAD software to draw the sectional views of 3 phase, single phase shell / core transformers.
4. Use the electrical CAD software to draw the sectional views of different parts of DC machine.
5. Use the electrical CAD software to draw the sectional views of different parts of Induction, synchronous machines.

**List of Experiments:**
1. Single line diagram of electrical substation.
2. DC Winding diagrams Simplex Lap and Wave windings.
3. DC Winding diagrams Duplex Lap and Wave windings.
4. AC Winding Diagrams: Integral and Fractional slot single layer Lap and Wave windings.
5. AC Winding Diagrams: Integral and Fractional slot double layer Lap and Wave windings.
6. Transformers - sectional views of single and three phase core type transformers.
7. Transformers - sectional views of single and three phase shell type transformers.
8. D.C. machine - sectional views of different parts: yoke, field system, armature and commutator.
10. Synchronous machine: sectional view.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
2. Manuals of Auto - CAD.

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CIRCUITS & LINEAR SYSTEMS SIMULATION LABORATORY
Sub Code : 13EE606          Credits : 02
Hrs/Week : 0+0+3+0          Total Hours : 52
************************************************************************
Course Outcomes:
At the end of the course student will be able to
1. Verify the network theorems for different types of electrical networks using Simulation software.
2. Use the simulation software to solve resonance circuits, diode clipping clamping circuits, Op-Amp, BJT circuits.
3. Use the simulation tools to verify time / frequency domain analysis. Also Verify root locus bode plot nyquist plot for a given system using the simulation software.
4. Solve the differential equation, verify sampling theorem, convolution theorem using the simulation software.
5. Compute N point DFT, Design and implement IIR, FIR filters using Simulation software.

List of Experiments:
Module 1 – Following experiments to be Simulated using PSpice / Multisim (or Equivalent)
1. Verification of KCL and KVL for multiloop electrical circuits with DC and AC controlled independent sources.
2. Verification of Thevenin’s, Norton’s Maximum power transfer theorem for AC and DC circuits.
3. a. Series and parallel resonance plot of current, impedance, admittance, power factor and determination of Q factor and bandwidth.
   b. Diode clipping, clamping, rectifier circuits (half wave, full wave and bridge rectifier).
4. a. Inverting non-inverting circuits using OPAMP
   b. RC phase shift oscillator using OPAMP.
5. a. Performance of BJT RC phase shift oscillator.
   b. Simulation of 2-stage RC coupled amplifier and determination of gain, frequency response, bandwidth, half power frequencies.

Module 2 - Following experiments to be Simulated using MATLAB / Simulink (or Equivalent)
6. a. Simulation of a typical second order system and determination of step response to evaluate time domain specifications & frequency domain specifications.
   b. Simulate a D. C. position control system using MATLAB and obtain its step response.
7. a. Obtain the phase margin and gain margin for a given transfer function by drawing bode plot using MATLAB.
   b. To draw the root loci for a given transfer function and verification of breakaway point and imaginary axis crossing axis using MATLAB.
   c. To draw Polar plot, Nyquist plot for a given transfer function and verification of stability.
8. a. Verification of Sampling theorem and obtaining Impulse response of a given system.
b. Linear convolution of two given sequences by direct method and using DFT and IDFT

c. Circular convolution of two given sequences by direct method and using DFT and IDFT

9. a. Solving a given difference equation.

b. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.

10. a. Design and implementation of FIR filter to meet given specifications.

b. Design and implementation of IIR filter to meet given specifications

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**SWITCHED MODE POWER CONVERTERS**

**Course Outcomes:**
At the end of the course student will be able to

1. Understand the concepts of different types of DC-DC converters
2. Compare linear and switched mode converters and understand the principle of operation of dc-dc converter with isolation
3. Analyze and understand the concepts of switched mode inverters
4. Understand the working of different resonant converter
5. Analyze the role of power conditioners to suppress various power line disturbances and understand the working of UPS, design of magnetic components.

**UNIT – I**

UNIT –II

DC-DC switched mode converter comparison generalized comparison between switched mode and linear dc regulator, dc-dc converter with isolation – flyback converters, other flyback converter topologies, forward converter, push-pull converter, half and full bridge converter.

8 Hours

UNIT – III

DC-AC switched mode inverters: Basic concept of switch-mode Inverters, single-phase inverter, three phase inverters. SPWM inverter, detailed theory, working principles, modes of operation with circuit analysis, ripple in the inverter output, switch utilization, problems.

8 Hours

UNIT – IV

Resonant switch converters: Classification of resonant converter, Resonant switch converter – ZCS, ZVS, ZVS-CV dc-dc converters; Resonant dc-link inverter with ZVS, problems

7 Hours

UNIT-V

Power line disturbances, Power Conditioner and uninterruptible power supplies, solar power based bidirectional inverter- High frequency inductor and transformers design: specific inductor transformer design, Inductor and transformer design procedure, problems

8 Hours

TEXT BOOKS:

REFERENCE BOOKS:
1. Modern power electronics- Cyril Lander
RENEWABLE ENERGY SOURCES

Sub Code : 13EE612       Credits : 03
Hrs/Week : 3+0+0+0       Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Promote the implementation of Renewable energy source. And understand the principle of extraction of energy from conventional, nonconventional sources.
2. Understand the working principle and applications of solar based thermal, electrical and PV systems
3. Justify the usage of energy storage techniques and Understand the process of design and implement of wind based energy conversion systems
4. Understand the process of design and implement of biomass based energy conversion systems.
5. Understand the process of design and implement of tidal, OTEC based energy conversion systems and comprehend the emerging technologies in the area of RES.

UNIT - I
Energy Sources: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. 3 Hours

UNIT - II
Solar Thermal Systems: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green House. 4 Hours


UNIT – III


UNIT – IV
BIOMASS ENERGY: INTRODUCTION, PHOTOSYNTHESIS process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India. 7 Hours
UNIT – V

Energy from Ocean: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Estimation of Energy – Single basin and Double basin type TPP (no derivations. Simple numerical problems), Advantages and Limitation of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitation of OTEC.

5 Hours


3 Hours

TEXT BOOKS:

REFERENCE BOOKS:
DIGITAL SYSTEM DESIGN USING VHDL

Sub Code : 13EE613
Credits : 03
Hrs/Week : 3+0+0+0
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Appreciate the use of VHDL programming language to create various models, architecture and entities of Digital System Design
2. Understand the basics of behavioral modeling
3. Enumerate Structural and behavioral modeling
4. Understand the Design of networks for arithmetic operators
5. Understand the Complex Programmable Logic Devices and their architecture

UNIT I

Introduction: Introduction to computer aided design tool for digital systems hardware description language, introduction to VHDL, signal, variable, constants, data types-scalar, composite, incomplete types, file types, operators, overloading, logical operators, types of delays. Entity and architecture declaration, introduction to structural modeling, component declarations, introduction to data flow. 8 Hours

UNIT II

Introduction to behavioral modeling, process statements, sequential statements, if-else statements, case statements, loops, null, exit statements, subprograms and packages , generics, generate statements, configuration, guarded statement, block statements, assert, report, attribute. 7 Hours

UNIT III

Structural and behavioral modeling: VHDL programs on Boolean functions, 1bit adder, 4 bit adder, multiplexers, demultiplexers, encoder, decoder, code converter (gray code) , comparators, shift registers counters
UNIT IV

Design of networks for arithmetic operators: Design of serial adder with accumulator, state graph for control networks, design of binary multiplier, VHDL code for multiplication of signed binary numbers (2’s compliment multiplier), design of binary multiplier using SM charts, VHDL code for traffic light controller

UNIT V

Programmable logic devices: Read Only Memory, Programmable Logic Array, Programmable Array Logic, Other sequential programmable logic devices (PLD), FPGA XILINX 3000 SERIES.

TEXT BOOKS:
1. VHDL Programming by Example – Douglas L. Perry. fourth edition, Tata McGRAW HILL.
2. VHDL Primer, -J. Bhaskar Pearson / PHI, NewDelhi, 2003

REFERENCE BOOKS:
2. Digital Fundamentals using VHDL -Floyd, Pearson Education, 2003,

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ADVANCED CONTROL THEORY

Sub Code : 13EE614  
Credits : 03
Course Outcomes:
At the end of the course student will be able to

1. Introduce the state model, linearization of state equations.
2. Apply state space technique for modeling of LTI systems, solve the state equation.
3. Computation of state transition matrix, the eigen values, eigen vectors.
4. Analyze the system for controllability and observability and design the controller using pole placement techniques to ensure stability.
5. Comprehend the behavior and stability analysis of non linear system.

UNIT – I

State variable analysis & design: Introduction, concept of state, state variables & state model, state model of linear systems, linearization of state equations, State space representation using physical variables.

7 Hours

UNIT – II

State space representation using phase variables & canonical variables, Derivation of transfer function from state model, Solution of state equation.

8 Hours

UNIT – III

State transition matrix & its properties, computation using Laplace transformation, Cayley-Hamilton method (only computation), Eigen values, Eigen vectors, generalized Eigen vectors, diagonalisation.

8 Hours

UNIT – IV
Concept of controllability & observability, methods of determining the same.
Pole placement techniques: stability improvements by state feedback, necessary & sufficient conditions for arbitrary pole placement.  

8 Hours

UNIT – V

Introduction, behavior of non-linear system, common physical non linearity-saturation, friction, backlash, dead zone, relay, multi variable non-linearity, Phase plane method, singular points, stability of nonlinear system, limit cycles, construction of phase trajectories by Isocline method and Delta method.  

8 Hours

TEXT BOOKS:

REFERENCE BOOKS:

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OPERATIONS RESEARCH

Sub Code : 13EE615
Credits : 03
Hrs/Week : 3+0+0+0
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Formulate, model and obtain solution to the Linear Programming Problems.
2. Solve the dual of LPP and compare the results of dual and primal. Also apply replacement theory for efficient operations.
3. Efficiently solve transportation and assignment problems.
4. Formulate and solve game theory problems
5. Build the network and crash it effectively and efficiently using PERT / CPM methods

UNIT – I

Introduction: definition, OR models, characteristics and phases of OR. 2 Hours

Linear programming and Graphic Solution: Linear Programming: Formulation of Two variable LPP model, Graphical solution of two variables LPP, special cases in graphic solution: multiple optimal solution, infeasibility and unboundedness, simplex method: conditions and solutions to LPP using Simplex method, Big M method, Special cases in simplex method: multiple optimal, infeasibility, unboundedness, Degeneracy, sensitivity analysis. 7 Hours

UNIT – II

Duality: Definition of the dual problem, primal to dual relationships, economic interpretation of duality. 3 Hours

Replacement Theory: Introduction, Replacement policy for equipment which deteriorates gradually, replacement of items that fail suddenly, staff replacement 5 Hours

UNIT – III

Transportation Model: definition of transportation model, basic Feasible solution by NW Corner method, Least Cost method and MODI method, optimal solutions: stepping stone method, MODI method, the assignment model, traveling salesman problem. 8 Hours
UNIT – IV

GAME THEORY: Formulation of two-person, zero sum games, solving simple games, the Max-min min-max principles, graphical solution procedure, solving by linear programming 7 Hours

UNIT – V

PERT & CPM TECHNIQUES: Network representation, critical path computation, construction of the time schedule, variation under probabilistic models, crashing of simple networks, PERT calculations. 7 Hours

TEXT BOOKS:

REFERENCE BOOK:
1. "Optimization Techniques"-S. S. Rao,

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POWER ELECTRONICS SYSTEM DESIGN

Sub Code : 13EE621 Credits : 03
Hrs/Week : 3+0+0+0 Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Analyze measurement techniques to measure various electrical parameters
2. Understand the working and characteristics of Switching Regulator Control Circuits
3. Appreciate various Commercial PWM Control ICs and their Applications
4. Understand Switching Power Supply Ancillary, Supervisory & Peripheral Circuits and Components
5. Use the 555 timer, PLL, ADC, DAC circuits in the implementation of different gating / power electronics circuits

UNIT – I

**Introduction:** Measurement techniques for voltages, current, power, power factor in power electronic circuits, other recording and analysis of waveforms, sensing of speed.  

7 Hours

UNIT – II

**Switching Regulator Control Circuits:** Introduction, isolation techniques of switching regulator systems, PWM systems.  

8 Hours

UNIT – III

**Commercial PWM Control ICs and their Applications:** TL 494 PWM Control IC, UC 1840 Programmable off line PWM controller, UC 1524 PWM control IC, UC1846 current mode control IC, UC 1852 resonant mode power supply controller.  

8 Hours

UNIT – IV

**Switching Power Supply Ancillary, Supervisory & Peripheral Circuits and Components:** Introduction, Opto-couplers, self-biased techniques used in primary side of reference power supplies, Soft/Start in switching power supplies, current limit circuits, over voltage protection, AC line loss detection.  

8 Hours

UNIT – V

**Phase – Locked Loops (PLL) & Applications:** PLL Design using ICs, 555 timer & its applications, analog to digital converter using IC’s, digital to analog converters using ICs, implementation of different gating circuits.  

8 Hours
REFERENCE BOOKS


DATA STRUCTURES

Sub Code : 13EE622          Credits : 03
Hrs/Week : 3+0+0+0           Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Understand the design, analysis of algorithms, Basic data types and trees with reference to data structure.
2. Understand the basic operation on sets and representation of directed graphs
3. Expound the sorting procedure and understand the Algorithm analysis Techniques.
5. Understand the Data structures and Algorithm for external storage

UNIT – I

Design and Analysis of Algorithms: From problems to programs, Data Structures and Abstract Data types.
Basic Data Type and Trees: Data types List, Implementation of lists, stacks Queues, Mappings, Stacks and recursive procedures. Basic terminology, ADT Tree, Implementation of trees, Binary trees.

9 Hours

UNIT – II

Basic Operation on Sets: Introduction to sets an ADT with union intersection and difference, A Bit-vector implantation sets, A linked list implementation sets, The dictionary, simple dictionary implementation, the Hash table data structures, Estimating the efficiency of functions, Implementation of the mapping ADT, Priority Queues, Implementation of priority queues.
Directed Graphs: Basic Definitions, Representation for directed graphs, the single source short path problems, Traversals of Directed Graphs,
Directed A cyclic graphs, strong components.  

9 Hours

UNIT – III

Sorting: The internal sorting model, simple sorting schemes, Quick sort, Heapsort, Binsorting. Algorithm analysis Techniques: Efficiency of algorithms, analysis of receive programs solving Recurrence Equations, A general solution for a large class of Recurrences.  

8 Hours

UNIT – IV

Algorithm Design Techniques: Divide and conquer algorithms, Dynamic programming, Greedy Algorithms, Back tracking, local search algorithms.  

7 Hours

UNIT – V

Data structures and Algorithm for external storage: A model of external computation, External sorting, sorting information in files, external search Trees.  

7 Hours

TEXT BOOK:

REFERENCE BOOKS:
1. Introduction to Data structures and Algorithms with C+ by Gleen. W.Rowe, PHI Publications.

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ADVANCED MICROPROCESSOR
Course Outcomes:
At the end of the course student will be able to
1. Enumerate the architecture and architectural feature of 8086 microprocessors.
2. Understand different assembler instruction formats and different instruction available
3. Comprehend the concept of modular programming, stacks, procedure, interrupts and macros
4. Identify and use the byte, string manipulation and i/o programming instructions
5. Understand the concept of multiprocessor configuration and the architectural feature of 8087, 8089, 801486, and Pentium processors

UNIT – I
8086 architecture, internal operation, addressing modes, instruction formats, instruction executing timing 8 Hours

UNIT - II
Assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, loop instructions, FLAG instructions, logical instructions, SHIFT AND ROTATE instructions, directives and operators, structures assembly process. 8 Hours

UNIT – II
Modular programming linking and relocation, stacks, procedures, procedure communication, recursive procedures, interrupts and interrupt routines, macros 7 Hours

UNIT-IV
Byte and string manipulations: string instructions, rep prefix  
2 Hours

I/O programming: fundamental I/O programming, programmed I/O, interrupt I/O, DMA  
2 Hours

System bus structure: typical system bus architecture, 8086 configurations, minimum mode system, maximum mode systems  
4 Hours

UNIT – V

Multiprocessor configurations: co-processor configurations, loosely coupled configurations, architecture and working of 8087 NDP, architecture and working of 8089 IOP  
5 Hours

Architecture of 80486 and Pentium processors  
3 Hours

TEXT BOOKS
1. Y.C.Liu & G.A.Gibson microprocessor systems: The 8086/8088 family PHI

REFERENCE BOOKS
1. Microprocessor and interfacing- Douglas V. Hall TMH

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PROGRAMMABLE LOGIC CONTROLLERS

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**Course Outcomes:**
At the end of the course student will be able to

1. Justify the role of PLC in automation / SCADA and the hardware capabilities of PLC in industrial automation and
identify various I/O devices and their characteristics for interfacing with PLC.

2. Program a PLC using Ladder Diagram, Functional Block Diagram (FBD).

3. Program a PLC using Instruction list (IL), Sequential Functions Charts (SFC) and Structured Text (ST) methods incorporating internal relays.

4. Incorporating timers /counters to program a PLC

5. Program a PLC using shift registers, data handling instructions, Comprehend the real world industrial applications of PLC using ladder diagram and instruction list.

UNIT - I

INTRODUCTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. 8 Hours

UNIT - II

PROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering ladder programs, functional blocks, program examples, location of stop and emergency switches 7 Hours

UNIT - III

PROGRAMMING LANGUAGES: Instruction list, sequential functions charts, structured text
INTERNAL RELAYS: ladder programs, battery- backed relays, one - shot operation, set and reset, master control relay, example programs, jump and call subroutines. 9 Hours

UNIT - IV

Timers and counters: Types of timers, programming timers, OFF- delay timers, pulse timers, programming examples, forms of counter, programming, up and down counting, timers with counters, sequencer.
UNIT - V
Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, closed loop control, temperature control and bottle packing applications.

Note: Discussing the programming should be restricted to only one type of PLC (Mitsubishi)

TEXT BOOKS:

REFERENCE BOOKS:

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ILLUMINATION TECHNOLOGY

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Course Outcomes:
At the end of the course student will be able to
1. Understand the importance of Light- Eye & Vision in designing luminaries
2. Comprehend the Propagation of light & photometric units
3. Understand the process of Production of radiation and their characteristics
4. Enumerate the principle of Artificial light sources
5. Understand the Design objective and methods for Interior lighting

UNIT – I


7 Hours

UNIT – II


8 Hours

UNIT – III


8 Hours

UNIT – IV

7 Hours

UNIT – V

Interior lighting design: Lighting design objectives-safely and health performance-appearance & comport lighting design flow chart. Lighting for commercial and public buildings such as offices, hotels teaching establishments and hospital lighting Lighting for industrial buildings, low & high bay area’s general lighting designs. Lighting for display-Shops & super markets, art galleries, museum lighting, lumen method of calculations-simple problems

9 Hours

TEXT BOOK:

REFERENCE BOOKS:
1. Ronald N. Helms- Illumination Engineering for Energy Efficiency Luminous Environment PH  

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EMPLOYABILITY SKILL DEVELOPMENT

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UNIT - I
Analytical Aptitude Skill: concept of analytical skill, definition-logical thinking and testing of Analytical Aptitude

UNIT - II
Quantitative Aptitude skill-Concept-definition-Preliminary requirement for development of quantitative skill- testing of quantitative skill.

UNIT - III
Verbal and ability skill – Knowledge and Vocabulary and grammar- comprehension-Verbal Reasoning skill

REFERENCE BOOKS:
Examination pattern:
This course is a mandatory learning course without credit. Continuous internal examination (CIE) consists of 2 internal exams (20 marks each) and tasks (10 marks). There is no semester end examination (SEE). The student will be awarded PP or NP grade as per autonomous regulations.